

RIGGING – TABLE OF CONTENTS

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WAC 296-155-556 Rigging – General Requirements

The rigging requirements in this part apply to all construction activities.

WAC 296-155-55600 General Requirements

(1) Employers must use qualified riggers during hoisting activities for assembly and disassembly work (WAC 296-155-53402(19)(a)). Additionally, qualified riggers are required whenever workers are within the fall zone and hooking, unhooking, or guiding a load, or doing the initial connection of a load to a component or structure (WAC 296-155-53400(43)(c)).

(2) All slings in use must meet the applicable requirements for design, inspection, construction, testing, maintenance and operation as prescribed in ASME B30.9, 2010.

- (3) All rigging hardware in use must meet the applicable requirements for design, inspection, construction, testing, maintenance and operation as prescribed in ASME B30.26, 2010.
- (4) All rigging gear must be used in accordance with the manufacturer's recommendations or a qualified person.
- (5) All below the hook lifting devices in use must meet the applicable requirements for design, inspection, construction, testing, maintenance and operation as prescribed in ASME B30.20, 2010.
- (6) All hooks in use must meet the applicable requirements for design, inspection, construction, testing, maintenance and operation as prescribed in ASME B30.10, 2009.
- (7) Repair of hooks must be approved by the manufacturer or qualified person and as follows:
- (a) Cracks, nicks, and gouges may be repaired by a competent person, all others repairs are done by the manufacturer or a qualified person.
 - (b) Grind longitudinally, following the contour of the hook.
 - (c) Do not reduce the dimension of the hook more than ten percent from the original.
- (8) Hooks must not be modified by welding and/or drilling unless written approval by the manufacturer has been received.
- (9) A qualified person must inspect the rigging equipment before each day or shift and:
- (a) Consider the application the equipment will be used for, and determine if it's safe for use.
 - (b) Remove the equipment from service if using it will create a hazard or meets any of the removal criteria listed in this chapter.
- (10) The rated load of the rigging equipment must not be exceeded.
- (11) All rigging hardware must be inspected in accordance with Table 11, each day before using. If a daily inspection is not feasible because the hardware is in a semi-permanent or inaccessible location, a periodic inspection is allowed instead of daily.
- (12) Rigging hardware must be removed from service when it shows any conditions listed in Table 11, or any other hazardous condition.

Table 11
Rigging Hardware Inspection/Removal Criteria

For all hardware, inspect for the following:
Missing or illegible identification
Indications of heat damage, including weld spatter or arc strikes
Excessive pitting or corrosion
Load bearing components that are <ul style="list-style-type: none"> - Bent - Twisted - Distorted - Stretched - Elongated - Cracked - Broken
Excessive nicks or gouges
10% reduction of the original or catalog dimension at any point
Excessive thread damage or wear, where applicable
Evidence of unauthorized welding or modification
Any other conditions that cause doubt as to the safety of continued use
On Shackles , also inspect for incomplete pin engagement
On swivels and swivel hoist rings , check for lack of ability to freely rotate or pivot
On Compression hardware , also check for <ul style="list-style-type: none"> Unauthorized replacement components Insufficient number of wire rope clips Improperly tightened wire rope clips Damaged wire rope Indications of wire rope slippage Improper assembly
On Swivels , check for loose or missing nuts, bolts, cotter pins, snap rings, or other fasteners and retaining devices
On Blocks check for <ul style="list-style-type: none"> - Loose or missing nuts, bolts, cotter pins, snap rings, or other fasteners and retaining devices - Misalignment or wobble in sheaves - Excessive sheave groove corrugation or wear

(13) Any alteration or modification of rigging hardware must be in accordance with the hardware manufacturer or a qualified person and proof load tested to 125%. This test must be documented and available upon request.

(14) Welding of rigging hardware is prohibited unless authorized by the manufacturer or an RPE.

(15) Replacement parts must meet or exceed the original rigging hardware manufacturer's specifications.

(16) Rigging hardware selection must have the characteristics suitable for the application and environment where it will be used.

(17) Workers must keep all parts of their body from between the load and any rigging during the lift.

(18) If handling intermodal shipping containers at a construction site, the employer must follow the requirements in chapter 296-56 WAC, Longshore, Stevedore and Waterfront Related Operations, Part F, Specialized Terminals and the guidelines found in International Organization for Standardization (ISO) 3874 – Series 1 Freight Containers, fifth edition – Handling and Securing.

WAC 296-155-558 Slings

WAC 296-155-55800 Chain Slings

(1) Only use chain slings that are made from grade eighty or higher alloy steel chain.

(2) The following requirements must be met if manufacturing your own chain slings:

- (a) Have a design factor of four,
- (b) Meet the rated load requirements in subsection (9) of this section.

(3) Rate chain slings with the load capacity of the lowest rated component of the sling. For example, if you use fittings that are rated lower than the sling material itself, identify the sling with the lower rated capacity.

(4) Makeshift fittings, such as hooks or links formed from bolts, rods, or other parts are prohibited.

(5) All chain slings must have legible identification information attached to the sling which includes the following information:

- (a) Name or trademark of the manufacturer;
- (b) Grade;
- (c) Nominal chain size;
- (d) Number of legs;
- (e) Rated loads for the vertical hitch and bridle hitch and the angle upon which it is based;
- (f) Length (reach);
- (g) Individual sling identification (e.g. serial numbers);
- (h) Repairing agency, if the sling was ever repaired.

(6) Inspections.

(a) A qualified person must inspect chain slings before their initial use, according to Table 12, both:

- (i) When the sling is new; and
- (ii) Whenever a repair, alteration, or modification has been done.

(b) A qualified person must perform a visual inspection for damage, each day or shift the chain sling is used. Immediately remove from service any sling damaged beyond the criteria in Table 12.

(c) A qualified person must perform periodic inspections on chain slings according to Table 12.

(i) Each link and component must be examined individually, taking care to expose and examine all surfaces including the inner link surfaces.

(ii) Remove slings from use:

- If any of the conditions in Table 12 are found;
- When they have been exposed to temperatures above one thousand degrees F.

(d) A written record of the most recent periodic inspection must be kept, including the condition of the sling.

Note: An external code mark on the sling is an acceptable means of recording the inspection as long as the code can be traced back to a record.

Table 12
Chain Sling Inspection/Removal Criteria

Inspect alloy steel chain slings for the following conditions:	Perform inspections:
<ul style="list-style-type: none"> • Missing or illegible sling identification • Cracks or breaks • Excessive nicks, gouges, or wear beyond that allowed in Table 13, Minimum Allowable Thickness at Any Point on a Link • Stretched chain links or components • Bent, twisted or deformed chain links or components • Evidence of heat damage • Excessive pitting or corrosion • Inability of chain or components to hinge (articulate) freely • Weld spatter • Hooks that have any of the following conditions: <ul style="list-style-type: none"> ▪ Any visibly apparent bend or twist from the plane of the unbent hook. ▪ Any distortion causing an increase in throat opening of five percent, not to exceed one-quarter inch, or as otherwise recommended by the manufacturer. ▪ Wear exceeding ten percent of the original section dimension of the hook or its load pin, or as otherwise recommended by the manufacturer. ▪ A self-locking mechanism that does not lock (if applicable). ▪ Any latch that does not close the hook's throat (if applicable). • Other visible damage that raises doubt about the safety of the sling 	<ul style="list-style-type: none"> • At least once a year for slings in normal service, which means use within the rated load • At least once a quarter for slings in severe service, which involves abnormal operating conditions • As recommended by a qualified person for slings in special service, which is anything other than normal or severe.

Table 13
Minimum Allowable Thickness at Any Point on a Link

Nominal Chain or Coupling Link Size		Minimum Allowable Thickness at Any Point on the Link	
Inches	Millimeters	Inches	Millimeters
$\frac{7}{32}$	5.5	0.189	4.80
$\frac{9}{32}$	7	0.239	6.07
$\frac{5}{16}$	8	0.273	6.93
$\frac{3}{8}$	10	0.342	8.69
$\frac{1}{2}$	13	0.443	11.26
$\frac{5}{8}$	16	0.546	13.87
$\frac{3}{4}$	20	0.687	17.45
$\frac{7}{8}$	22	0.750	19.05
1	26	0.887	22.53
$1\frac{1}{4}$	32	1.091	27.71

(7) Repair, alterations, or modifications.

(a) Chain slings must be repaired as follows:

- (i) Slings must only be repaired by the manufacturer or a qualified person
- (ii) Chain used for sling repair must be alloy steel chain manufactured and tested in accordance with ASTM A 391 / A 391M for Grade 80 chain and ASTM A 973 / A 973M for Grade 100 chain.
- (iii) Components for alloy steel chain slings must be manufactured and tested in accordance with ASTM A 952 / A 952M.
- (iv) The use of mechanical coupling links within the body of a chain sling to connect two pieces of chain is prohibited.
- (v) Replace cracked, broken, or bent chain links or components instead of repairing them.

(b) The sling must be marked to show the repairing agency.

(c) Repaired slings must be proof tested according to the requirements in subsection (8) of this section. If only replacing components of the sling, and the components were individually proof tested, the sling does not have to be tested as a whole.

Note: For additional requirements relating to repair and modification see WAC 296-155-55600(9).

(8) Proof test chain slings.

(a) Prior to initial use, all new and repaired chain and components of an alloy steel chain sling, either individually or as an assembly must be proof tested by the sling manufacturer or a qualified person. Follow the requirements in Table 14, Chain Sling Proof Load Requirements.

Table 14
Chain Sling Proof Load Requirements

When proof testing this type of equipment:	Then proof load :
<ul style="list-style-type: none"> • Single or multiple leg slings. • Components attached to single legs. 	Each leg and component to at least two times the single leg vertical hitch rated load.
<ul style="list-style-type: none"> • Master links for double leg bridle slings. • Single basket slings. • Master coupling links connected to two legs. 	To at least four times the single leg vertical hitch rated load.
<ul style="list-style-type: none"> • Master links for triple and quadruple leg bridle slings. • Double basket bridle sling. 	To at least six times the single leg vertical hitch rated load.

(9) Chain slings rated loads, the term “working load limit” is commonly used to describe rated load.

Note:

Rated loads are based on the following factors:

- Strength of sling materials
- Design factor
- Type of hitch
- Angle of loading

(a) Chain slings must be used within the rated loads shown in Tables 1 through 4 of ASME B30.9, 2010. For angles that are not shown in these tables, either use the rated load for the next lower angle or one calculated by a qualified person.

(b) The use of horizontal sling angles less than thirty degrees are prohibited, unless recommended by the sling manufacturer or a qualified person. See Figure 12, Multiple-Leg Bridle Sling Hitch.

(c) Rated loads must be verified for slings used in a choker meet the values shown in the above referenced tables provided that the angle of choke is one hundred and twenty degrees or greater. See Figure 13, Single-Leg Choker Hitch.

(d) Rated loads for angles of choke less than one hundred and twenty degrees must be determined by the manufacturer or a qualified person.

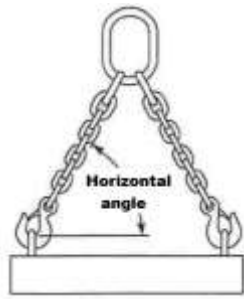


Figure 12
Multiple-Leg Bridle Sling Hitch

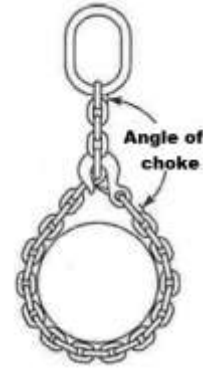


Figure 13
Single-Leg Choker Hitch

(10) Use of chain slings.

- (a) Shorten or adjust slings using only methods approved by the manufacturer or a qualified person.
- (b) Slings must not be shortened or lengthened by knotting or twisting.
- (c) Twisting and kinking must be avoided.
- (d) Hitch slings in a way that provides control of the load.
- (e) Balance the load in slings used in a basket hitch to prevent it from slipping.
- (f) Slings must be protected from sharp edges of the load. See Figure 14.
- (g) The sling must be prevented from snagging anything during the lift, with or without load.

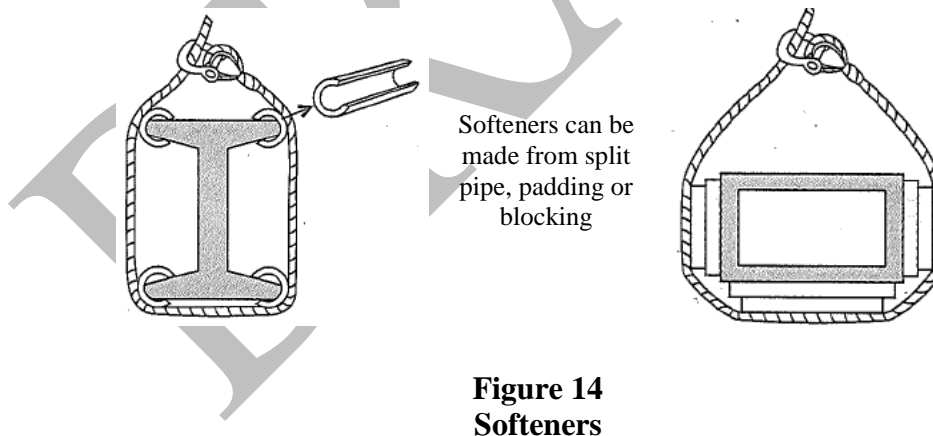


Figure 14
Softeners

WAC 296-155-55805 Wire Rope Slings.

(1) Manufacturing wire rope slings.

- (a) Wire rope slings must be made from new or unused regular lay wire rope. The wire rope must be manufactured and tested in accordance with ASTM A 1023-02 and ASTM A 586.
- (b) The following fabrication methods must be used to make wire rope slings:

- (i) Hand splicing.
 - (ii) Turnback eye.
 - (iii) Return loop
 - (iv) Flemish eye mechanical splicing.
 - (iv) Poured or swaged socketing.
- (c) Wire rope slings must have a design factor of five.
- (d) Wire rope slings must meet the requirements in Table 16.
- (e) Using any of the following when making wire rope slings is prohibited:
- (i) Rotation resistant wire rope
 - (ii) Malleable cast iron clips
 - (iii) Knots
 - (iv) Wire rope clips, unless:
 - The application of the sling prevents using prefabricated slings
 - The specific application is designed by a qualified person.
- (f) Wire rope clips, if used, must be installed and maintained in accordance with the recommendations of the clip manufacturer or a qualified person, or in accordance with the provisions of ASME B30.26 – 2010.
- (g) Slings made with wire rope clips must not be used as a choker hitch.

Note: If using wire rope clips under these conditions, follow the guidance given in Table 15.

Table 15

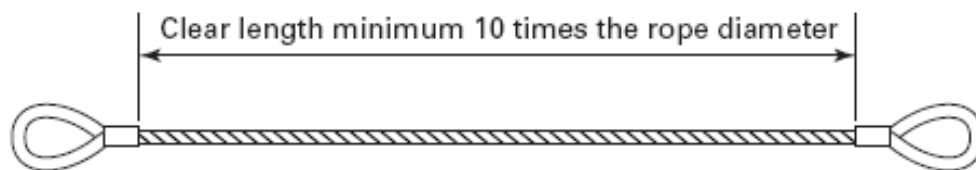
Number, Torque Values, and Turn Back Requirements for U-Bolt Wire Rope Clips			
Clip & Wire Rope Size (inches)	Min. No. of Clips	Amount of Rope Turn Back in Inches	* Torque in Ft. Lbs.
1/8	2	3-1/4	4.5
3/16	2	3-3/4	7.5
1/4	2	4-3/4	15
5/16	2	5-1/4	30
3/8	2	6-1/2	45
7/16	2	7	65
1/2	3	11-1/2	65
9/16	3	12	95
5/8	3	12	95
3/4	4	18	130
7/8	4	19	225
1	5	26	225
1-1/8	6	34	225
1-1/4	7	44	360
1-3/8	7	44	360
1-1/2	8	54	360
1-5/8	8	58	430
1-3/4	8	61	590
2	8	71	750
2-1/4	8	73	750
2-1/2	9	84	750
2-3/4	10	100	750
3	10	106	1200
3-1/2	12	149	1200

Number, Torque Values and Turn Back Rqmts. for Double Saddle (Fist Grip) Wire Rope Clips			
Clip & Wire Rope Size (inches)	Min. No. of Clips	Amount of Rope Turn Back in Inches	* Torque in Ft. Lbs.
3/16-1/4	2	4	30
5/16	2	5	30
3/8	2	5 1/4	45
7/16	2	6 1/2	65
1/2	3	11	65
9/16	3	12 3/4	130
5/8	3	13 1/2	130
3/4	4	16	225
7/8	4	26	225
1	5	37	225
1-1/8	5	41	360
1-1/4	6	55	360
1-3/8	6	62	500
1-1/2	7	78	500

* The tightening torque values shown are based upon the threads being clean, dry, and free of lubrication.

Table 16
Wire Rope Sling Configuration Requirements

If you have	Then you need
<ul style="list-style-type: none"> Slings made of rope with 6 x 19 and 6 x 36 classification Cable laid slings 	A minimum clear length of rope 10 times the rope diameter between splices, sleeves, or end fittings (See Figure 15, Minimum Sling Length) unless approved by a qualified person.
<ul style="list-style-type: none"> Braided slings 	A minimum clear length of rope forty times the component rope diameter between the loops or end fittings (See Figure 16, Minimum Braided Sling Length) unless approved by a qualified person.
<ul style="list-style-type: none"> Grommets and endless slings 	A minimum circumferential length of ninety-six times the body diameter of the grommet or endless sling unless approved by a qualified person
<ul style="list-style-type: none"> Other configurations 	Specific limitation data provided by a qualified person. These slings must meet all other requirements of ASME B30.9, 2010.



**Figure 15 –
Minimum Sling Length
For rope with 6x19 and 6x36 classification
or Cable Laid Slings**

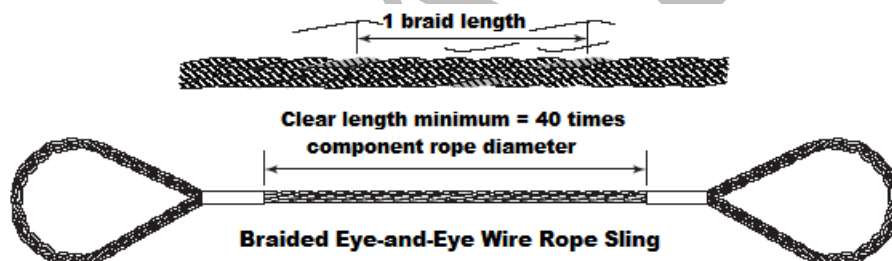


Figure 16 - Minimum Braided Sling Length







(2) Wire rope sling fittings.

- (a) Fittings must be used according to the fitting manufacturer's directions.
- (b) Rate slings with the load capacity of the lowest rated component of the sling. For example, if you use fittings that are rated lower than the sling material itself, identify the sling with the lower rated capacity.
- (c) Weld any end attachments, except covers to thimbles, before assembling the sling.

(3) Identification information. All wire rope slings must have legible identification information attached to the sling which includes the information below, see sample tag in Figure 17. For slings in use that are manufactured before the effective date of this rule, the information below must be added before use or at the time the periodic inspection is completed.

- (a) Name or trademark of the manufacturer.

- (b) Diameter or size.
- (c) Rated loads for the types of hitches used, and the angle that the load is based on.
- (d) Number of legs, if more than one.
- (e) Repairing agency, if the sling is ever repaired.

Vert. 	Chock 	Vert. Basket 
2.2 Tons	1.6 Tons	4.4 Tons
Rated Capacity by Angle		
60° 	45° 	30° 
3.8 Tons	3.1 Tons	2.2 Tons

Note: Sample Tag for a ½” Single-Leg Sling 6x19 or 6x36 Classification, Extra Improved Plow Steel (EIPS) Grade Fiber Core (FC) Wire Rope with a Mechanical Splice (Ton = 2,000 lb).

Figure 17
Sample Wire Rope Sling ID Tag

(4) Inspection.

- (a) A qualified person must inspect wire rope slings before their initial use, according to Table 17, both:
 - (i) When the sling is new; and
 - (ii) Whenever a repair, alteration, or modification has been done.
- (b) A qualified person must perform a visual inspection for damage, each day or shift the wire rope sling is used:
 - (i) Include all fastenings and attachments;
 - (ii) Immediately remove any sling from service that is damaged beyond the criteria listed in Table 17; or
 - (iii) Remove fiber core wire rope slings that have been exposed to temperatures higher than one hundred and eighty degrees F.
- (c) A qualified person must perform periodic inspections on wire rope slings according to Table 17.
 - (i) Inspect the entire length of the sling including splices, end attachments, and fittings.
 - (ii) Remove slings from use if any of the conditions in Table 17 are found.
 - (iii) Keep a record of the most recent periodic inspection available, including the condition of the sling.

Note: An external code mark on the sling is an acceptable means of recording the inspection as long as the code can be traced back to a record.

Table 17
Wire Rope Sling Inspection and Removal Criteria

Inspect wire rope slings for the following conditions:	Perform inspections
<ul style="list-style-type: none"> • Missing or illegible sling identification • Severe localized abrasion or scraping • Kinking, crushing, birdcaging, or any other condition resulting in damage to the rope structure • Evidence of heat damage • Severe corrosion of the rope, end attachments, or fittings • End attachments that are cracked, deformed, or worn to the extent that the strength of the sling is substantially affected • Broken wires: <ul style="list-style-type: none"> – For strand-laid and single-part slings, 10 randomly distributed broken wires in one rope lay, or five broken wires in one strand in one rope lay. – For cable-laid slings, 20 broken wires per lay. – For six-part braided slings, 20 broken wires per braid. – For eight-part braided slings, 40 broken wires per braid. • Hooks that have any of the following conditions: <ul style="list-style-type: none"> – Any visibly apparent bend or twist from the plane of the unbent hook – Any distortion causing an increase in throat opening 5%, not to exceed ¼ inch, or as recommended by the manufacturer – Wear exceeding 10%, of the original section dimension of the hook or its load pin, or as recommended by the manufacturer – Self-locking mechanism that does not lock. • Other visible damage that raises doubt about the safety of the sling 	<ul style="list-style-type: none"> • At least once a year for slings in normal service • At least once a quarter for slings in severe service • As recommended by a qualified person for slings in special service.

(5) Repair, alterations, or modifications.

(a) Repair wire rope slings as follows:

- (i) Make sure slings are only repaired by the sling manufacturer or a qualified person.
- (ii) Mark the sling to show the repairing agency
- (iii) Do not repair wire rope used in slings, wire rope must be replaced. Only end attachments and fittings can be repaired on a wire rope sling.

(b) Modification or alterations to end attachments or fittings must be considered as repairs and must conform to all other provisions of this part.

(c) Proof load test repaired slings according to the requirements in subsection (6) of this section.

(6) Proof load tests. Make sure the sling manufacturer or a qualified person proof load tests the following slings before initial use, according to Table 18:

- (a) All repaired slings.
- (b) All slings incorporating previously used or welded fittings.
- (c) For single- or multiple-leg slings and endless slings, each leg must be proof loaded according to the requirements listed in Table 18 based on fabrication method. The proof load test must not exceed fifty percent of the component ropes' or structural strands' minimum breaking strength.

Table 18
Wire Rope Sling Proof Load Test Requirements

Type of equipment:	Proof load test:
<ul style="list-style-type: none">Mechanical splice slings	Each leg to at least two times the single leg vertical hitch rated load.
<ul style="list-style-type: none">Swaged socket and poured socket slings	Each leg to at least two times, but not more than two and one-half, times the single-leg vertical hitch rated load.
Note: For mechanical splice, swaged socket and poured socket slings follow the rope manufacturer's recommendations for proof load testing provided that it is within the above-specified proof load range, including subsection (6)(c) above.	
<ul style="list-style-type: none">Hand tucked slings, if proof load tested	To at least one, but not more than one and one-quarter, times the single-leg vertical hitch rated load.

(d) The proof load test for components (fittings) attached to single legs must meet the requirements in subsection (6)(c) above.

(e) Proof load testing for master links must be in accordance with Table 19.

Table 19
Proof Load Test for Master Links on Wire Rope Slings

• Master links for two-leg bridle slings	To at least four times the single-leg vertical hitch rated load
• Master links for three-leg bridle slings	To at least six times the single-leg vertical hitch rated load.
• Master links for four-leg bridle slings	To at least eight times the single-leg vertical hitch rated load

(7) Rated load. The term “rated capacity” is commonly used to describe rated load.

Note: Rated loads are based on the following factors:

- Strength of sling material.
- Design factor.
- Type of hitch.
- Angle of loading. (*See Figure 18, Angle of Loading*)
- Diameter of curvature over which the sling is used (D/d). (*See Figure 19, D/d ratio*)
- Fabrication efficiency.

(a) Wire rope slings must be used within the rated loads shown in Tables 7 through 15 in ASME B30.9, 2010. For angles that are not shown in these tables, either use the rated load for the next lower angle or have a qualified person calculate the rated load.

(b) Prohibit the use of horizontal sling angles less than thirty degrees unless recommended by the sling manufacturer or a qualified person. See Figure 18.

(c) Rated loads for slings used in a choker hitch must conform to the values shown in the above referenced tables, provided that the angle of choke is one hundred and twenty degrees or greater. See Figure 20 and Table 20, Angle of Choke.

(d) Use either Figure 20 and Table 20, the manufacturer, or a qualified person to determine the rated load if the angle of choke in a choker hitch is less than 120 degrees.



Figure 18
Angle of Loading

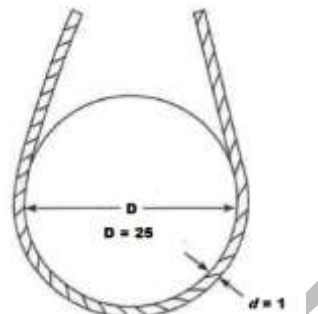


Figure 19
D/d Ratio

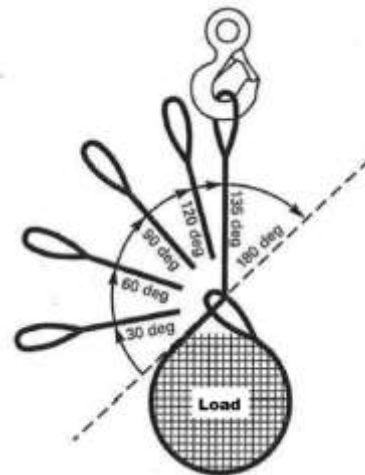


Figure 20
Angle of Choke

Note: When D is 25 times the component rope diameter(d) the D/d ratio is expressed as 25/1.

Table 20
Angle of Choke

Angle of Choke, deg.	Rated Capacity, %
Over 120	100
90 – 120	87
60 – 89	74
30 – 59	62
0 – 29	49

Note: Percent of sling rated capacity in a choker hitch.

(8) Use of wire rope slings.

- (a) Hitch the slings in a way that provides control of the load.
- (b) Shorten or adjust slings using only the methods approved by the manufacturer or qualified person.
 - Do **not** shorten or lengthen by knotting, twisting, or by wire rope clips.
- (c) Keep all parts of the human body from between the sling and the load, crane, or hoist hook.
- (d) Prohibit all of the following:
 - (i) Intentional shock loading;
 - (ii) Avoid twisting and kinking.

(e) Decrease the rated load of the sling when D/d ratios (Figure 19) smaller than 25/1. Consult the sling manufacturer for specific data or refer to the Wire Rope Sling User's Manual (Wire Rope Technical Board).

(f) Follow Table 21, Use of Wire Rope Slings or Clips, when using any of the identified wire rope slings or clips.

(g) Slings in contact with edges, corners, or protrusions must be protected with a material of sufficient strength, thickness, and construction to prevent damage to the sling. See Figure 14.

Table 21
Use of Wire Rope Slings or Clips

If you are using	Then
Single leg slings used with multiple-leg slings	Make sure the rating shown is not exceeded in any leg of the multiple-leg sling
Hand tucked slings are used in a single leg vertical lift	Do not allow the sling or load to rotate
Slings made with wire rope clips	Must not be used as a choker hitch
U-bolt wire rope clips	Use only U-bolt wire rope clips that are made of drop-forged steel
	Follow Table 15 for the number and spacing of the clips
	Apply the U-bolt so the "U" section is in contact with the dead end of the rope (See Figure 21, <i>Installation and Loading</i>)

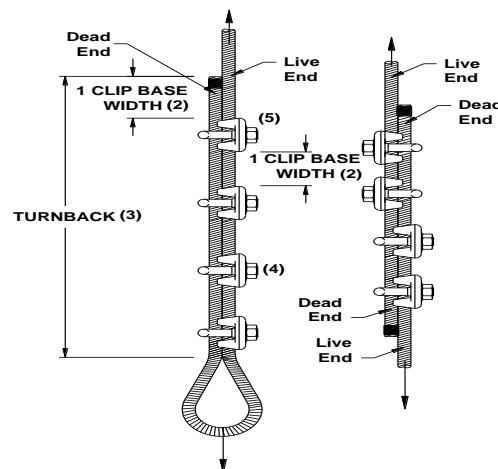


Figure 21
Installation and Loading

Proper Installation Requires

- Correct number of clips for wire rope size
- Correct spacing of clips
- Correct turnback length
- Correct torque on nuts
- Correct orientation of saddle on live end

WAC 296-155-55810 Metal mesh slings.

(1) Identification information on metal mesh slings. Make sure all slings have legible identification information permanently attached to the sling which includes all of the following information:

- (a) Name or trademark of the manufacturer;
- (b) Rated loads for the types of hitches used, and the angle they're based on;
- (c) Width and gauge;
- (d) Number of legs, if more than one;
- (e) Individual sling identification (e.g., serial numbers);
- (f) Repairing agency, if the sling has ever been repaired.

(2) Inspection.

(a) A qualified person must inspect metal mesh slings before their initial use, according to Table 22, both:

- (i) When the sling is new; and
- (ii) Whenever a repair, alteration, or modification has been done.

(b) A qualified person must perform a visual inspection for damage, each day or shift the metal mesh sling is used. Immediately remove from service any sling damaged beyond the criteria in Table 22.

(c) A qualified person must perform periodic inspections on metal mesh slings according to Table 22.

- (i) Inspect the entire length, including splices, end attachments, and fittings.
- (ii) Remove slings from use if any of the conditions in Table 22 are found.
- (iii) Keep a record of the most recent periodic inspection available, including the condition of the sling.

Note: An external code mark on the sling is an acceptable means of recording the inspection as long as the code can be traced back to a record.

Table 22
Metal Mesh Sling Inspection Table

Inspect metal mesh slings for conditions such as the following:	Perform inspections
<ul style="list-style-type: none"> • Missing or illegible sling identification • Broken welds along the sling edge • Broken brazed joints along the sling edge • Broken wire in any part of the mesh • Reduction in wire diameter of <ul style="list-style-type: none"> ▪ Twenty-five percent due to abrasion ▪ Fifteen percent due to corrosion • Lack of flexibility due to the distortion of the mesh • Distortion of the choker fitting so the depth of the slot is increased by more than ten percent • Distortion of either end fitting so the width of the eye opening is decreased by more than ten percent • A fifteen percent reduction of the original cross-sectional area of any point around the hook opening of the end fitting • Visible distortion of either end fitting out of its plane • Cracked end fitting • Slings in which the spirals are locked or without free articulation • Fittings that are pitted, corroded, cracked, bent, twisted, gouged, or broken. • Other visible damage that raises doubt about the safety of the sling 	<ul style="list-style-type: none"> • At least once a year for slings in normal service • At least once a quarter for slings in severe service • As recommended by a qualified person for slings in special service.

(3) Repair, alteration, or modifications. Repair metal mesh slings as follows:

- (a) Make sure slings are only repaired by the manufacturer or a qualified person
- (b) Straightening of spiral or cross rods, or forcing a spiral into position is prohibited (see Figure 22)
- (c) Mark the sling to show the repairing agency
- (d) Replace cracked, broken, bent or damaged metal mesh or components instead of repairing them
- (e) Proof load test repaired slings according to subsection (4) of this section.

(4) Proof load testing.

- (a) Make sure the sling manufacturer or a qualified person proof load tests all new and repaired metal mesh slings before initial use;
- (b) Use a proof load test that is a minimum of two times the vertical hitch rated load.

(5) Rated load.

Note: Rated loads are based on the following factors:

- Strength of sling material
- Design factor
- Type of hitch
- Angle of loading

- (a) Metal mesh slings must be used within the rated loads shown in Table 17 in ASME B30.9, 2010. For angles that are not shown in these tables, use either the rated load for the next lower angle or one calculated by a qualified person.
- (b) Rate slings with the load capacity of the lowest rated component of the sling. For example, if fittings are rated lower than the sling material itself, identify the sling with the lower rated capacity.
- (c) The use of horizontal sling angles less than thirty degrees is prohibited, unless recommended by the sling manufacturer or a qualified person.
- (d) Rated loads for slings used in a choker hitch must conform to the values shown in the above referenced table, provided that the angle of choke is one hundred and twenty degrees or greater.
- (e) Have the manufacturer or a qualified person determine the rated load if the angle of choke in a choker hitch is less than one hundred and twenty degrees.

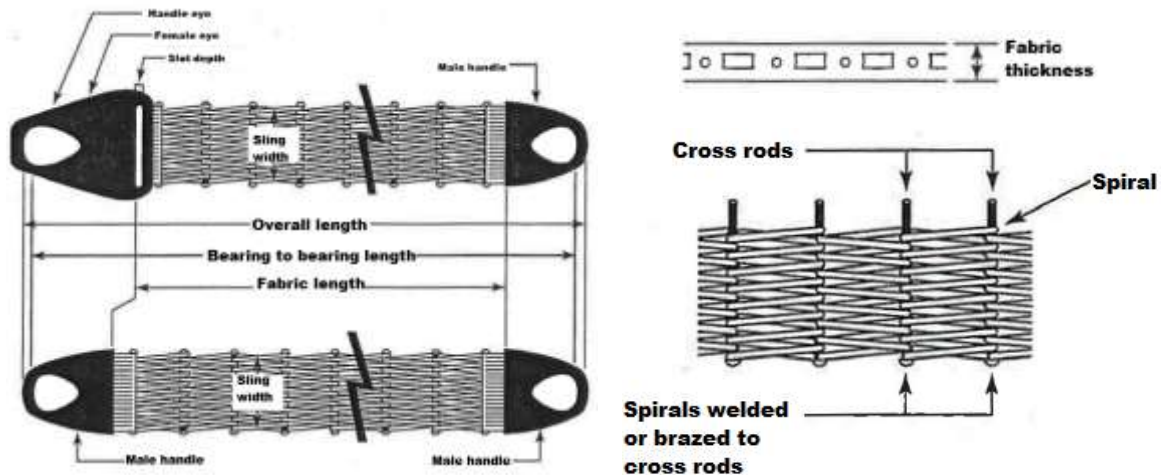


Figure 22
Metal Mesh Sling

(6) Use of metal mesh slings.

- (a) Use metal mesh slings safely by doing all of the following:
 - (i) Shorten or adjust slings using only the methods approved by the manufacturer or a qualified person;
 - (ii) Sling legs must not be kinked;
 - (iii) Hitch slings in a way that provides control of the load.
- (b) Keep all parts of the human body from between the sling and the load, crane, or hoist hook.
- (c) Prohibit the following:
 - (i) The use of metal mesh slings as bridles on suspended personnel platforms;
 - (ii) Intentional shock loading;
 - (iii) Straightening a spiral or cross rod or forcing a spiral into position;
 - (iv) Avoid twisting and kinking.

Note: Slings in contact with edges, corners, or protrusions should be protected with a material of sufficient strength, thickness, and construction to prevent damage. See Figure 14.

WAC 296-155-55815 Synthetic rope slings. (See Figure 23)

- (1) Identification. Verify all slings have legible identification information attached to the sling which includes the following information:
 - (a) Name or trademark of the manufacturer;
 - (b) Manufacturer's code or stock number;
 - (c) Type of fiber material;
 - (d) Rated loads for the types of hitches used, and the angle that the load is based on;
 - (e) Number of legs, if more than one.
 - (f) Repairing agency, if the sling has ever been repaired.

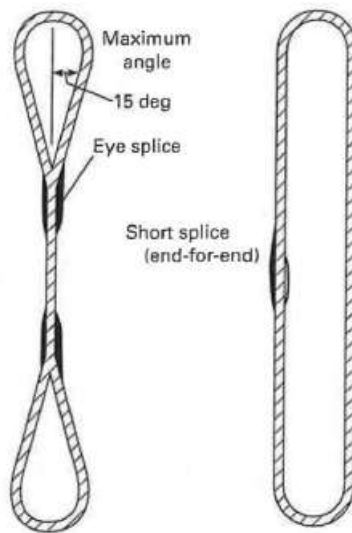


Figure 23
Synthetic Fiber Rope Slings

(2) Inspection.

- (a) A qualified person must inspect synthetic fiber rope slings before their initial use, according to Table 23, both:
 - (i) When the sling is new; and
 - (ii) Whenever a repair, alteration, or modification has been done.
- (b) A qualified person must perform a visual inspection for damage, each day or shift the synthetic fiber rope sling is used. Immediately remove any sling from service that is damaged beyond the criteria listed in Table 23.
- (c) A qualified person must perform periodic inspections on synthetic fiber rope slings, according to Table 23.
 - (i) Examine each sling and component individually, taking care to expose and examine all surfaces;
 - (ii) Inspect the entire length including splices, end attachments, and fittings;
 - (iii) Remove slings from use if any of the conditions in Table 23 are found;
 - (iv) Keep a record of the most recent periodic inspection available, including the condition of the sling.

Note: An external code mark on the sling is an acceptable means of recording the inspection as long as the code can be traced back to a record.

Table 23
Synthetic Rope Sling Inspection and Removal Criteria

Inspect synthetic rope slings for the following conditions:	Perform inspections:
<ul style="list-style-type: none"> • Missing or illegible sling identification • Cuts, gouges, or areas of extensive fiber breakage along the length • Abraded areas on the rope • Damage that is estimated to have reduced the effective diameter of the rope by more than 10% • Uniform fiber breakage along the major part of the length of the rope in the sling such that the entire rope appears covered with fuzz or whiskers • Inside the rope, fiber breakage, fused or melted fiber (observed by prying or twisting to open the strands) involving damage estimated at 10% of the fiber in any strand or the rope as a whole. • Discoloration, brittle fibers, and hard or stiff areas that may indicate chemical, ultraviolet or heat damage. • Dirt and grit in the interior of the rope structure that is deemed excessive. • Foreign matter that has permeated the rope, making it difficult to handle and attracting and holding grit • Kinks or distortion in the rope structure, particularly if caused by forcibly pulling on loops (known as hockles). • Melted, hard, or charred areas that affect more than 10% of the diameter of the rope or affect several adjacent strands along the length that affect more than 10% of strand diameters. • Poor condition of thimbles or other components manifested by corrosion, cracks, distortion, sharp edges, or localized wear. • Hooks that have any of the following conditions: <ul style="list-style-type: none"> – Any visibly apparent bend or twist from the plane of the unbent hook – Any distortion causing an increase in throat opening 5%, not to exceed ¼ inch, or as recommended by the manufacturer – Wear exceeding 10%, of the original section dimension of the hook or its load pin, or as recommended by the manufacturer – Self-locking mechanism that does not lock. • Other visible damage that raises doubt about the safety of the sling. 	<ul style="list-style-type: none"> • At least once a year for slings in normal service • At least once a quarter for slings in severe service • As recommended by a qualified person for slings in special service

(3) Repair, alteration, or modifications. Meet the following requirements when repairing synthetic rope slings:

- (a) Synthetic rope slings must only be repaired by the manufacturer or a qualified person
- (b) Mark the sling to show the repairing agency
- (c) Use components that meet the requirements of this part for sling repair
- (d) Do not repair slings by knotting or re-splicing existing sling ropes
- (e) Proof load test repaired slings according to the requirements in subsection (4) of this section.

(4) Proof load test. The sling manufacturer or a qualified person must proof load test repaired slings and slings incorporating previously used or welded fittings before initial use, according to Table 24:

Table 24 Synthetic Rope Sling Proof Load Requirements	
Type of equipment:	Proof load test:
- Single leg slings - Multiple leg slings - Endless slings - Fittings attached to single legs	To a minimum of two times the single leg vertical hitch rated load.
Master links for two-leg bridle slings	To a minimum of four times the single leg vertical hitch rated load.
Master links for three-leg bridle slings	To a minimum of six times the single leg vertical hitch rated load.
Master links for four-leg bridle slings	To a minimum of eight times the single leg vertical hitch rated load.

(5) Rated load.

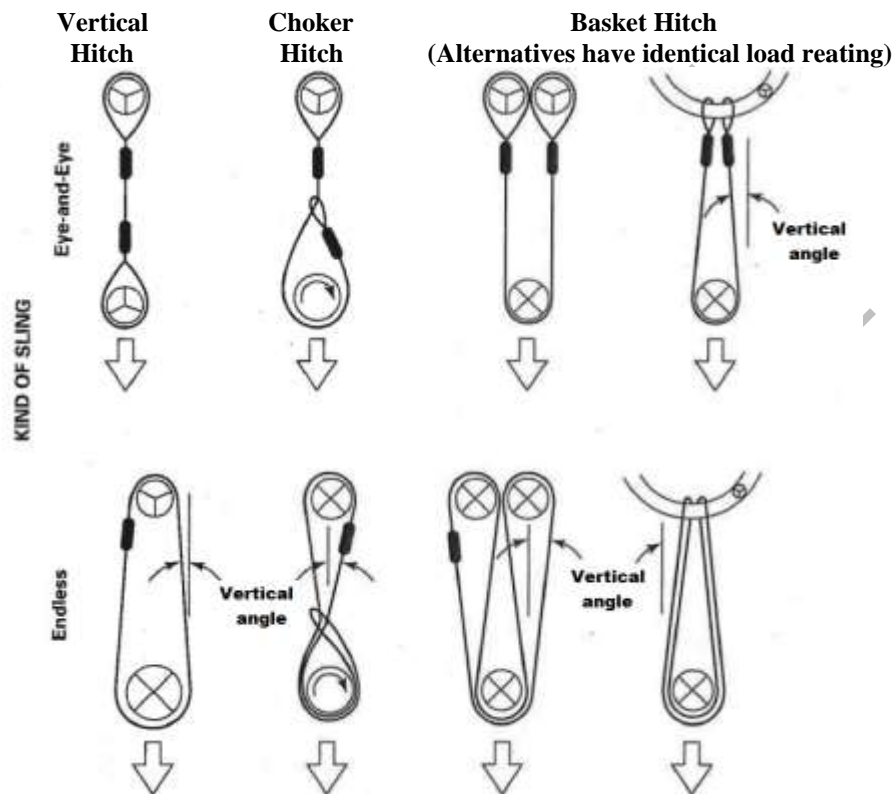
Note: Rated loads are based on the following factors:

- Strength of the sling material
- Design factor
- Type of hitch (See Figures 24, Hitch Types for Synthetic Rope Slings)
- Angle of loading (See Figure 18, Angle of Loading)
- Diameter of curvature over which the sling is used (See Figure 19, D/d Ratio)




(a) Synthetic rope slings must be used within the rated loads shown in Tables 18 and 19 in ASME B30.9, 2010. For angles that are not shown in these tables, either use the rated load for the next lower angle or one calculated by a qualified person.

(b) Rate slings with the load capacity of the lowest rated component of the sling. For example, if you use fittings that are rated lower than the sling material itself, identify the sling with the lower-rated capacity.

- (c) The use of horizontal sling angles less than 30 degrees is prohibited, unless recommended by the sling manufacturer or a qualified person. (See Figure 18).
- (d) Rated loads for slings used in a choker hitch must conform to the values shown in the above referenced tables, provided that the angle of choke is 120 degrees or greater.
- (e) Use Figure 20, the manufacturer, or a qualified person to determine the rated load if the angle of choke in a choker hitch is less than 120 degrees.



The symbols below represent load or support in contact with the rope sling. The contact surface diameter divided by the rope diameter is designated D/d ratio as described in Figure 19.

-  Represents a contact surface which must have a diameter of curvature at least double the diameter of the rope from which the sling is made.
-  Represents a contact surface which must have a diameter of curvature at least 8 times the diameter of the rope.
-  Represents a load in choker hitch and illustrates the rotary force on the load and/or the slippage of the rope in contact with the load. Diameter of curvature of load surface must be at least double the diameter of the rope.

Note: Legs 5 degrees or less from vertical may be considered vertical. For slings more than 5 degrees vertical, the actual angle must be used.

Figure 24
Hitch Types for Synthetic Rope Slings

(6) Use of synthetic ropes.

- (a) Use synthetic rope slings safely by doing all of the following:
 - (i) Shorten or adjust slings only with methods approved by the manufacturer or qualified person;
 - (ii) Slings must not be shortened or lengthened by knotting or twisting;
 - (iii) Hitch slings in a way that provides control of the load;
 - (iv) Slings in contact with edges, corners, protrusions, or abrasive surfaces must be protected with a material of sufficient strength, thickness, and construction to prevent damage, see Figure 14;
 - (v) Do not allow the sling or load to rotate when hand-tucked slings are used in a single-leg vertical lift application;
 - (vi) Keep all parts of the human body from between the sling and the load, crane, or hoist hook.
- (b) All of the following is prohibited:
 - (i) Intentional shock loading;
 - (ii) Twisting or kinking.

WAC 296-155-55820 Synthetic webbing slings. (See Figure 25)

- (1) Identification. Make sure all slings have legible identification information permanently attached to the sling which includes the following information:
- (a) Name or trademark of the manufacturer;
 - (b) Manufacturer's code or stock number;
 - (c) Rated loads for the types of hitches used, and the angle that the load is based on.
 - (d) Type of synthetic web material;
 - (e) Number of legs, if more than one;
 - (f) Repairing agency, if the sling is ever repaired.

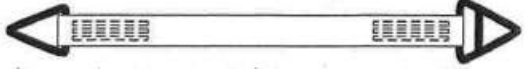

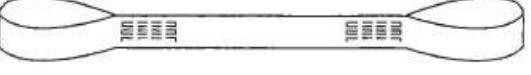
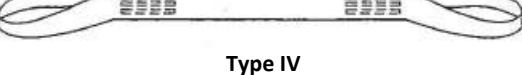
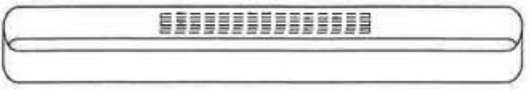
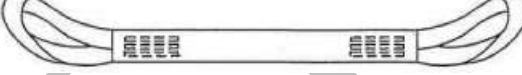
 <p>Type I Sling made with triangle fitting on one end and a slotted triangle choker fitting on the other end. It can be used in a vertical, basket, or choker hitch.</p>	 <p>Type II Sling made with a triangle fitting on both ends. It can be used in a vertical or basket hitch only.</p>
 <p>Type III Sling made with a flat loop eye on each end with loop eye opening on same plane as sling body. This type of sling is sometimes called a flat eye-and-eye, eye-and-eye, or double-eye sling.</p>	 <p>Type IV Sling made with both loop eyes formed as in Type III, except that the loop eyes are turned to form a loop eye which is at a right angle to the plane of the sling body. This type of sling is commonly referred to as a twisted-eye sling.</p>
 <p>Type V Endless sling, sometimes referred to as a grommet. It is a continuous loop formed by joining the ends of the webbing together.</p>	 <p>Type VI Return-eye (reversed-eye) sling is formed by using multiple widths of webbing held edge-to-edge. A wear pad is attached on one or both sides of the sling body and one or both sides of the loop eyes to form a loop eye at each end which is at a right angle to the plane of the sling body.</p>

Figure 25
Synthetic Webbing Slings

(2) Inspection.

- (a) A qualified person must inspect synthetic webbing slings before their initial use, according to Table 25:
 - (i) When the sling is new; and
 - (ii) Whenever a repair, alteration, or modification has been done.
- (b) A qualified person must perform a visual inspection for damage, each day or shift the synthetic webbing sling is used. Immediately remove from service any sling that is damaged beyond the criteria listed in Table 25.
- (c) A qualified person must perform periodic inspections on synthetic webbing slings, according to Table 25.
 - (i) Examine each sling and component individually, taking care to expose and examine all surfaces.
 - (ii) Remove slings from use if any of the conditions in Table 25 are found.
 - (iii) Keep a written record of the most recent periodic inspection available, including the condition of the sling.

Note: An external code mark on the sling is an acceptable means of recording the inspection as long as the code can be traced back to a record.

Table 25
Synthetic Webbing Sling Inspection

Inspect synthetic webbing slings for the following conditions:	Perform inspections
<ul style="list-style-type: none"> • Missing or illegible sling identification • Acid or caustic burns • Melting or charring on any part of the sling • Holes, tears, cuts or snags • Broken or worn stitching in load bearing splices. • Excessive abrasive wear • Knots in any part of the sling • Discoloration, brittle fibers, and hard or stiff areas that may indicate chemical or ultraviolet/sunlight damage. • Fittings that are pitted, corroded, cracked, bent, twisted, gouged or broken • Hooks that have any of the following conditions: <ul style="list-style-type: none"> – Any visibly apparent bend or twist from the plane of the unbent hook – Any distortion causing an increase in throat opening 5 percent, not to exceed ¼ inch, or as recommended by the manufacturer – Wear exceeding 10 percent, of the original section dimension of the hook or its load pin, or as recommended by the manufacturer – Self-locking mechanism that does not lock. • Other visible damage that causes doubt about the safety of continued use of the sling 	<ul style="list-style-type: none"> • At least once a year for slings in normal service • At least once a quarter for slings in severe service • As recommended by a qualified person for slings in special service

(3) Repair, alterations, or modifications.

- (a) Meet the following requirements when repairing synthetic webbing slings:
- (i) Slings are only to be repaired by the manufacturer or a qualified person;
 - (ii) Temporary repairs are prohibited;
 - (iii) Mark the sling to show the repairing agency;
 - (iv) Components used for sling repair must meet the requirements of this part;
 - (v) Cracked, broken, melted, or otherwise damaged webbing material or fittings other than hooks must not be repaired;
 - (vi) Load bearing splices must not be repaired;
- (b) Proof load test repaired slings according to the requirements in subsection (4) of this section.

(4) Proof load test. The sling manufacturer or a qualified person must proof load test repaired slings and slings that have been altered or modified before initial use according to Table 26:

Table 26
Synthetic Webbing Sling Proof Test Requirements

Type of equipment:	Proof load test:
<ul style="list-style-type: none">- Single leg slings- Multiple leg slings- Endless slings,- Fittings attached to single legs	To a minimum of 2 times the single leg vertical hitch rated load.
Master links for 2-leg bridle slings	To a minimum of 4 times the single leg vertical hitch rated load.
Master links for 3-leg bridle slings	To a minimum of 6 times the single leg vertical hitch rated load.
Master links for 4-leg bridle slings	To a minimum of 8 times the single leg vertical hitch rated load.

(5) Rated loads.

Note: Rated loads are based on the following factors:

- Strength of the material.
- Design factor.
- Type of hitch.
- Angle of loading. (See Figure 18, Angle Of Loading)
- Fabrication efficiency.
- Diameter of curvature over which the sling is used.

(a) Synthetic web slings must be used within the rated loads shown in Tables 20 through 24 in ASME B30.9, 2010. For angles that are not shown in these tables, use either the rated load for the next lower angle or one calculated by a qualified person.

(b) Rate slings with the load capacity of the lowest rated component of the sling. For example, if you use fittings that are rated lower than the sling material itself, identify the sling with the lower rated capacity.

(c) The use of horizontal sling angles less than 30 degrees is prohibited, unless recommended by the sling manufacturer or a qualified person. (See Figure 18)

(d) Use Figure 20, Angle of Choke, the manufacturer, or a qualified person to determine the rated load if the angle of choke in a choker hitch is less than 120 degrees.

(e) Rated loads for slings used in a choker hitch must conform to the values shown in the above referenced tables, provided that the angle of choke is 120 degrees or greater. (See Figure 20)

(6) Use of synthetic webbing slings.

- (a) Use synthetic webbing slings safely by meeting all of the following requirements:
 - (i) Shorten or adjust slings only with methods approved by the manufacturer or qualified person.
 - (ii) Slings must not be shortened or lengthened by knotting or twisting.
 - (iii) Hitch slings in a way that provides control of the load.
 - (iv) Protect slings with material of sufficient strength, thickness, and construction to prevent damage from sharp edges, corners, protrusions, or abrasive surfaces. See Figure 14.
 - (v) Keep all parts of the human body from between the sling and the load, crane, or hoist hook.

(b) Intentional shock loading is prohibited.

WAC 296-155-55825 Synthetic roundslings (See Figure 26)

(1) Identification. All synthetic roundslings must be marked with the following information:

- (a) Name or trademark of the manufacturer.
- (b) Manufacturer's code or stock number.
- (c) Core material.
- (d) Cover material if different from core material.
- (e) Rated loads for the types of hitches used, and the angle that the load is based on.
- (f) Number of legs, if more than one.
- (g) Repairing agency, if the sling is ever repaired.

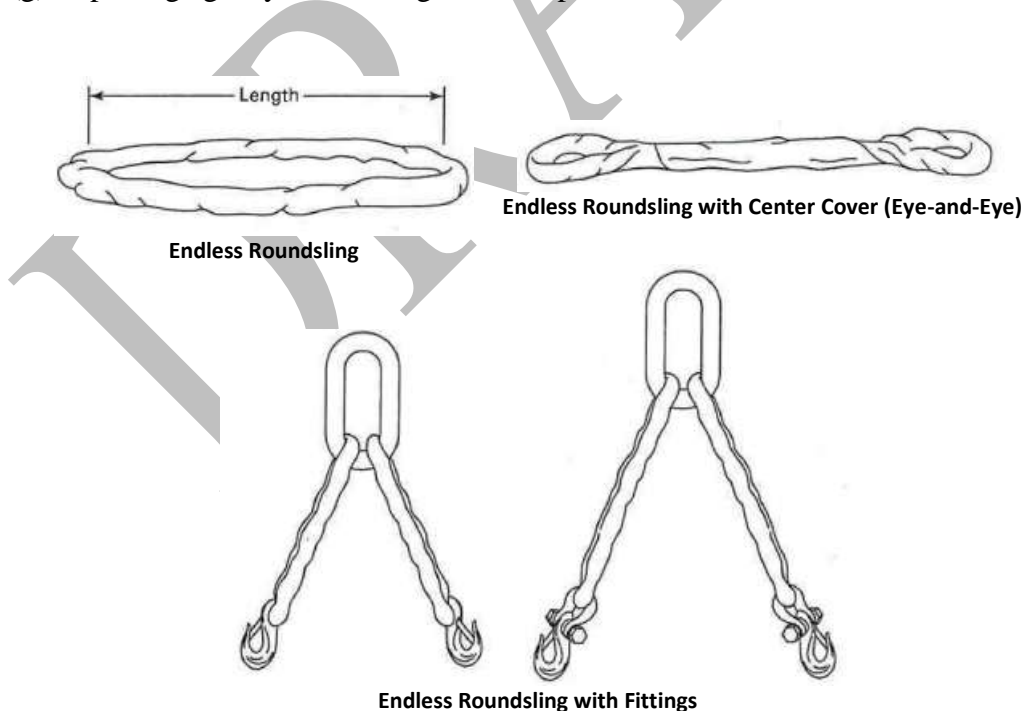


Figure 26
Synthetic Roundslings

(2) Inspection.

(a) A qualified person must inspect synthetic roundslings before their initial use, according to Table 27, both:

- (i) When the sling is new; and
- (ii) Whenever a repair, alteration, or modification has been done.

(b) A qualified person must perform a visual inspection for damage, each day or shift the synthetic roundslings are used. Immediately remove from service any sling that is damaged beyond the criteria listed in Table 27.

(c) A qualified person must perform periodic inspections on synthetic roundslings, according to Table 27.

- (i) Examine each sling and component individually, taking care to expose and examine all surfaces.
- (ii) Remove slings from use if any of the conditions in Table 27 are found.
- (iii) Keep a written record of the most recent periodic inspection available, including the condition of the sling.

Note: An external code mark on the sling is an acceptable means of recording the inspection as long as the code can be traced back to a record.

Table 27
Synthetic Roundslings Inspection and Removal Criteria

Inspect synthetic roundslings for conditions such as the following:	
<ul style="list-style-type: none"> • Missing or illegible sling identification. • Acid or caustic burns. • Evidence of heat damage. • Holes, tears, cuts, abrasive wear or snags that expose the core yarns. • Broken or damaged core yarns. • Weld spatter that exposes core yarns. • Roundslings that are knotted. • Fittings that are pitted, corroded, cracked, bent, twisted, gouged or broken. • Hooks that have any of the following conditions: <ul style="list-style-type: none"> – Any visibly apparent bend or twist from the plane of the unbent hook. – Any distortion causing an increase in throat opening 5percent, not to exceed ¼ inch, or as recommended by the manufacturer. – Wear exceeding 10 percent, of the original section dimension of the hook or its load pin, or as recommended by the manufacturer. – Self-locking mechanism that does not lock. • Other visible damage that causes doubt about the safety of continued use of the sling. 	<ul style="list-style-type: none"> • At least once a year for slings in normal service. • At least once a quarter for slings in severe service. • As recommended by a qualified person for slings in special service.

(3) Repair, alterations, or modifications.

(a) Meet the following requirements when repairing synthetic roundslings:

- (i) Only the manufacturer or a qualified person can repairs slings.
- (ii) Mark the sling to show the repairing agency.
- (iii) Only use components that meet the requirements of this rule to repair slings.
- (iv) Replace cracked, broken, or bent fittings other than hooks; do not repair them.
- (v) Both of the following are prohibited:
 - (A) Temporary repairs of roundslings or fittings.
 - (B) The repair of load bearing yarns.

(vii) Proof load test repaired slings according to the requirements in subsection (4) of this section.

(4) Proof load tests. The sling manufacturer or a qualified person must proof load test repaired slings and slings that have been altered or modified before initial use, according to Table 28:

Table 28
Synthetic Roundslings Proof Test Requirements

Type of equipment:	Proof load test:
<ul style="list-style-type: none"> • Single leg slings • Multiple leg slings • Endless slings • Fittings attached to single legs 	To a minimum of 2 times the single leg vertical hitch rated load.
Master links for 2-leg bridle slings	To a minimum of 4 times the single leg vertical hitch rated load.
Master links for 3-leg bridle slings	To a minimum of 6 times the single leg vertical hitch rated load.
Master links for 4-leg bridle slings	To a minimum of 8 times the single leg vertical hitch rated load.

(5) Rated loads.

Note: Rated loads are based on the following factors:

- Strength of the material.
- Design factor.
- Type of hitch.
- Angle of loading. (See Figure 18, Angle of Loading)
- Diameter of curvature over which the sling is used.

(a) Synthetic round slings must be used within the rated loads shown in Table 25 in ASME B30.9, 2010. For angles that are not shown in these tables, either use the rated load for the next lower angle or one calculated by a qualified person

(b) Rate slings with the load capacity of the lowest rated component of the sling. For example, if you use fittings that are rated lower than the sling material itself, identify the sling with the lower rated capacity.

(c) Prohibit the use of horizontal sling angles less than 30 degrees unless recommended by the sling manufacturer or a qualified person.

(d) Use Figure 18, Angle of Choke, the manufacturer, or a qualified person to determine the rated load if the angle of choke in a choker hitch is less than 120 degrees.

(e) Rated loads for slings used in a choker hitch must conform to the values shown in the above referenced table 40 provided that the angle of choke is 120 degrees or greater. (See Figure 18)

(6) Use of synthetic roundslings.

- (a) Use methods approved by the manufacturer or qualified person to shorten or adjust slings. Slings must not be shortened or lengthened by knotting or twisting.
- (b) Hitch slings in a way that provides control of the load.
- (c) Protect slings with material of sufficient strength, thickness, and construction to prevent damage from sharp edges, corners, protrusions, or abrasive surfaces. See Figure 14.
- (d) Keep all parts of the human body from between the sling and the load, crane, or hoist hook.
- (e) Intentional shock loading is prohibited.

WAC 296-155-560 Rigging hardware.

WAC 296-155-56000 General requirements.

(1) Inspections.

- (a) A qualified person must perform an inspection on all hardware according to Table 29, each day before using. If a daily inspection is not feasible because the hardware is in a semi-permanent or inaccessible location, a periodic inspection is allowed instead of daily.
- (b) Hardware must be removed from service when it shows any conditions listed in Table 29, or any other hazardous condition.

Table 29
Hardware Inspection

For all hardware, inspect for the following:
<input type="checkbox"/> Missing or illegible identification.
<input type="checkbox"/> For shackles, missing or illegible manufacturer's name or trademark and/or rated load identification.
<input type="checkbox"/> Indications of heat damage, including weld spatter or arc strikes.
<input type="checkbox"/> Excessive pitting or corrosion.
<input type="checkbox"/> Load bearing components that are: <ul style="list-style-type: none"> - Bent. - Twisted. - Distorted. - Stretched. - Elongated. - Cracked. - Broken.
<input type="checkbox"/> Excessive nicks or gouges. For riggings blocks, excessive nicks, gouges and wear.
<input type="checkbox"/> 10% reduction of the original or catalog dimension at any point. For shackles, this includes at any point around the body or pin.
<input type="checkbox"/> Excessive thread damage or wear, where applicable.
<input type="checkbox"/> Evidence of unauthorized welding or modification.
<input type="checkbox"/> Any other conditions that cause doubt as to the safety of continued use.
<input type="checkbox"/> On Shackles , also inspect for incomplete pin engagement.
<input type="checkbox"/> On swivels and swivel hoist rings , check for lack of ability to freely rotate or pivot.
<input type="checkbox"/> On Compression hardware , also check for: <ul style="list-style-type: none"> - Unauthorized replacement components. - Insufficient number of wire rope clips. - Improperly tightened wire rope clips. - Damaged wire rope. - Indications of wire rope slippage. - Improper assembly.
<input type="checkbox"/> On Swivels , check for loose or missing nuts, bolts, cotter pins, snap rings, or other fasteners and retaining devices.
<input type="checkbox"/> On Blocks check for: <ul style="list-style-type: none"> - Loose or missing nuts, bolts, cotter pins, snap rings, or other fasteners and retaining devices. - Misalignment or wobble in sheaves. - Excessive sheave groove corrugation or wear.

(2) Repairs, alterations, or modifications.

- (a) Rigging hardware must be repaired, altered or modified according to the hardware manufacturer or a qualified person.
- (b) Welding of hardware is prohibited unless authorized by the manufacturer.
- (c) Replacement parts must meet or exceed the original rigging hardware manufacturer's specifications.

(3) Hardware use.

- (a) Hardware must be selected with the characteristics suitable for the application and environment where it will be used.
- (b) The rated load of the hardware must not be exceeded.
- (c) All personnel using rigging hardware must meet the requirements of WAC 296-155-53306.

WAC 296-155-56005 Shackles.

- (1) Pins must be connected to the choking eye of the sling when a shackle is used in a choker hitch.
- (2) Screw pins must be:
 - (a) Fully engaged, with the shoulder in contact with the shackle body (See Figure 27, Typical Shackle Components).
 - (b) Rigged in a way that keeps the pin from unscrewing while in use.
 - (c) Secured from rotation or loosening if used for long-term installations.
- (3) Cotter pins must be kept in good working condition.
- (4) If the shackle is side loaded, reduce the rated load, according to the recommendations of the manufacturer or a qualified person. (See Figure 28, Side Loading)

Note: See Figure 29, Shackle Types for examples of types of shackles covered by this rule.

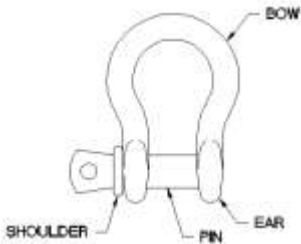
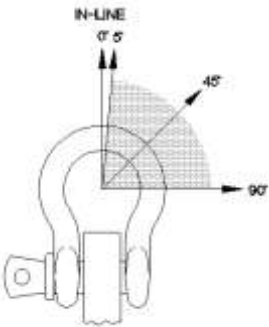


Figure 27
Typical Shackle Components



Side Loading Angle, deg.	% Rated Load Reduction
In-line (0) to 5	None
6 to 45	30%
46 to 90	50%
Over 90	Not permitted unless authorized by manufacturer or qualified person

Figure 28
Side Loading

Anchor Shackles

Chain Shackles

Synthetic Sling Shackles

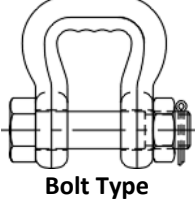
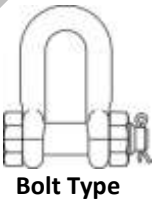


Figure 29
Shackle Types

WAC 296-155-56010 Adjustable hardware.

(1) Turnbuckles.

(a) Follow these rigging practices for turnbuckles:

- (i) Locking nuts, if used, must be compatible with the threads of the turnbuckle end. (See Figure 30, Turnbuckles Types)
- (ii) For long-term installations, secure turnbuckles in a way that prevents unscrewing.
- (iii) Turnbuckle end fitting threads must be fully engaged in the body threads.
- (iv) Components, including pins, bolts, nuts, or cotter pins used with jaw ends, must be in good working condition prior to use.

Notes:

- See Figure 30 for types of turnbuckles covered by this rule.
- Pipe bodies conceal the length of thread engagement. Verify full thread engagement before loading. See Figure 30.

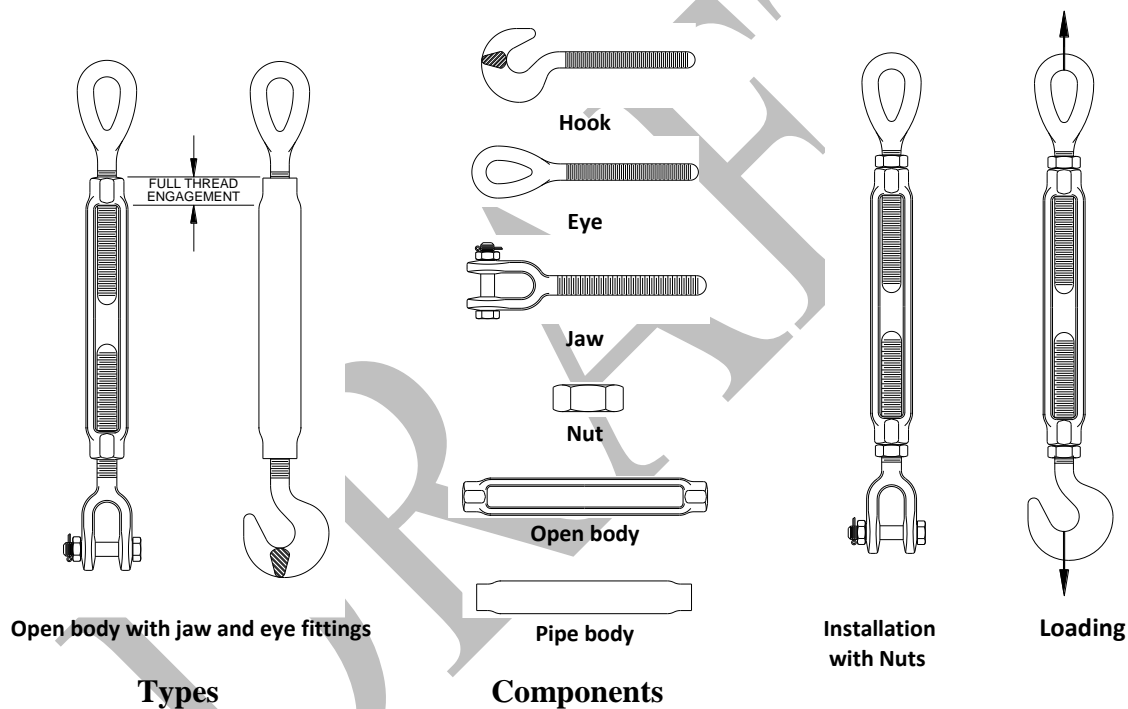


Figure 30
Turnbuckle Types

(2) Eyebolts.

(a) Follow these rigging practices for eyebolts:

- (i) Eyebolts not shouldered to the load must only be used for in-line loads. See Figure 31, Eyebolts.
- (ii) Only shoulder eyebolts must be used for angular lifting.
 - (A) The shoulder must be flush and securely tightened against the load

(B) The working load limit (WLL) must be reduced as shown in Figure 31.

(C) For angular lifts, the plane of the eye must be aligned with the direction of loading. If needed, flat washers can be used under the shoulder to position the plane of the eye. See Figure 31.

(iii) When using eyebolts in a tapped blind hole, the effective thread length must be at least 1 ½ times the diameter of the bolt for engagement in steel. See Figure 31. For other engagements, or engagements in other materials, contact the eyebolt manufacturer or a qualified person.

(iv) When using eyebolts in a tapped through-hole of less than one diameter thickness, a nut must be used under the load, and must be fully engaged and tightened securely against the load. See Figure 31.

(v) When eyebolts are used in an untapped through-hole, the nut under the load must be fully engaged. If the eyebolt is not shouldered to the load, a second nut on top of the load should be used if possible. See Figure 31.

Note: See Figure 31 for examples of eyebolts covered by this rule.

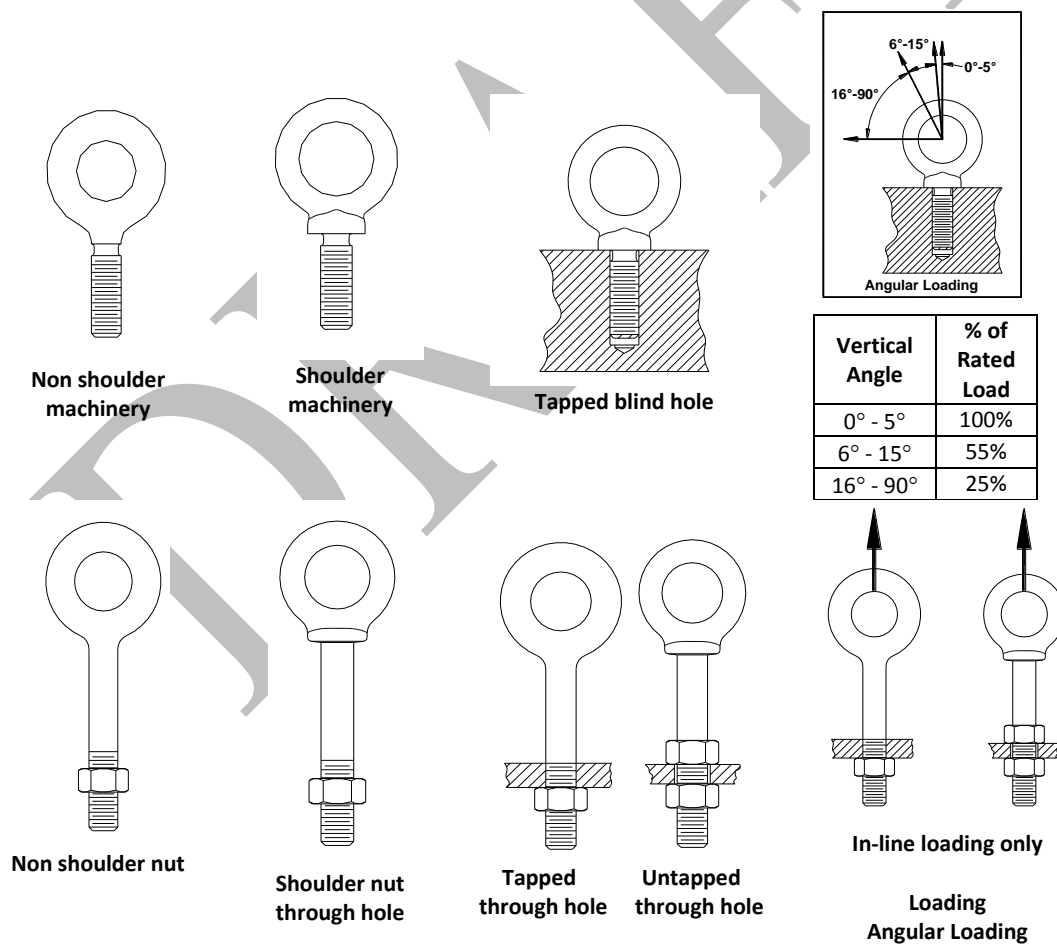


Figure 31
Eyebolts

- (3) Eye Nuts. Follow these rigging practices for eye nuts. See Figure 32, Eye Nuts:
- (a) The threads of eye nuts must be fully engaged.
 - (b) Eye nuts must only be used for in-line loads.
 - (c) Components must be in good working condition prior to use.

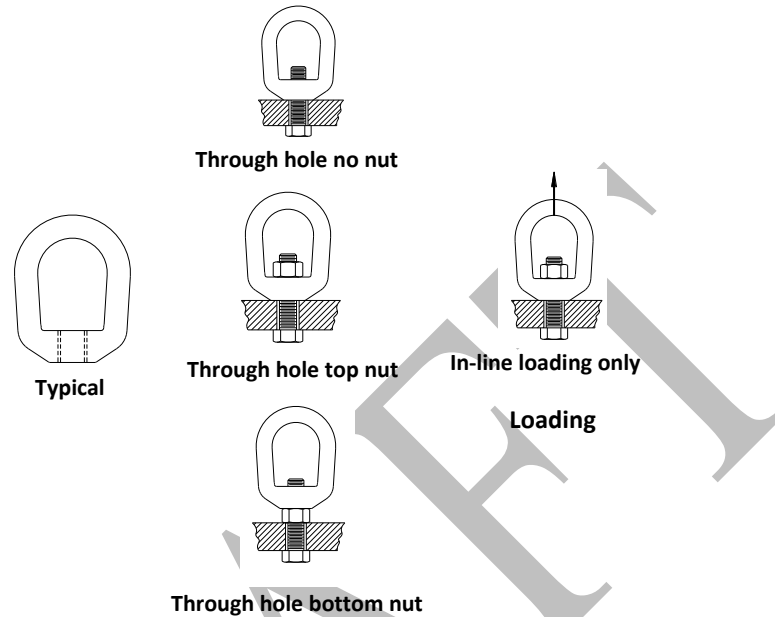


Figure 32
Eye Nuts

- (4) Swivel Hoist Rings. Follow these rigging practices for swivel hoist rings:
- (a) The swivel hoist ring working load limit (WLL) must meet or exceed the anticipated angular rigging tension. See Figure 33, Angle of Loading.
 - (b) Swivel hoist rings must be tightened to the torque specifications of the manufacturer.
 - (c) The swivel hoist ring must be free to rotate and pivot without interference during lifting. See Figure 34, Swivel Hoist Rings.
 - (d) The load applied to the swivel hoist ring must be centered in the bail to prevent side loading.
 - (e) Any attached lifting component must be narrower than the inside width of the bail to avoid spreading.
 - (f) When using swivel hoist rings in a threaded-hole, the effective thread length must be $1\frac{1}{2}$ times the diameter of the bolt for steel. See Figure 34. For other thread engagements or engagement in other materials, contact the manufacturer or a qualified person.
 - (g) When using swivel hoist rings in a through-hole application, a nut and washer must be used. A washer and nut must be in accordance with the manufacturer's recommendations. The nut must be fully engaged. See Figure 34.
 - (h) The bushing flange must fully contact the load surface. See Figure 34.

(i) Spacers or washers must not be used between the bushing flange and the mounting surface of the load being lifted.

Note: See Figure 34 for examples of swivel hoist rings covered by this rule.

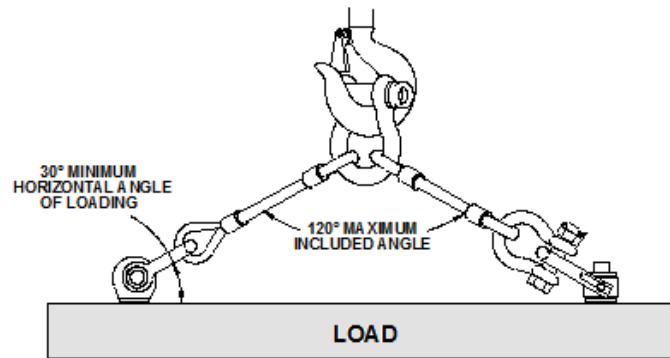


Figure 33
Angle of Loading (Adjustable Hardware)

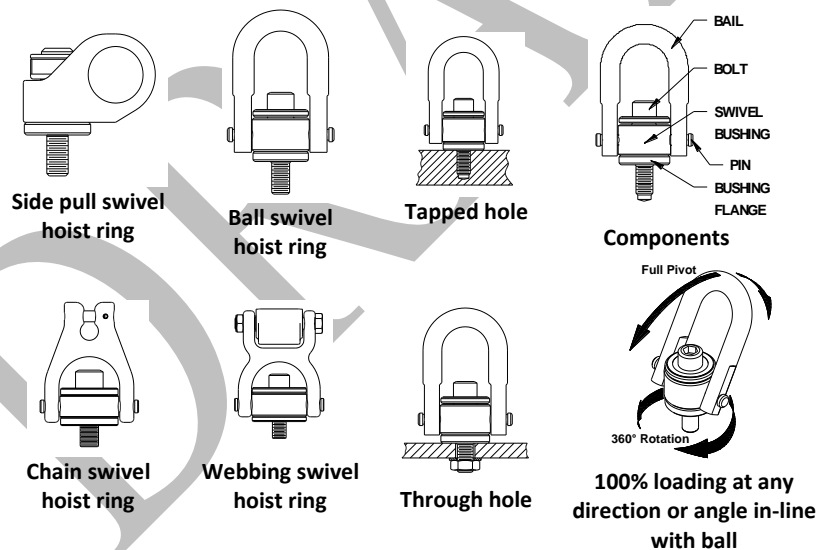
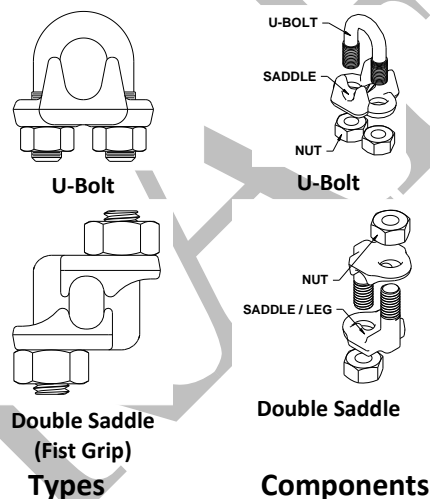


Figure 34
Swivel Hoist Rings

WAC 296-155-56015 Compression hardware.

(1) Wire Rope Clips. Follow these assembly requirements for wire rope clips:

- (a) Before installing a wire rope clip on plastic coated or plastic impregnated wire rope, the wire rope clip manufacturer, wire rope manufacturer or a qualified person must be consulted.
- (b) For U-bolt clips used to create end terminations, the saddle must be placed on the live end of the wire rope, with the U-bolt on the dead end side. See Figure 35, Wire Rope Clips.
- (c) The assembly must be tested by loading the connection to at least the expected working load. After unloading, re-tighten the wire rope clips to the torque recommended by the manufacturer or a qualified person
- (d) Follow the manufacturer's recommendations for the minimum number of clips, spacing and turn-back measurements, and to the recommended torque values. In the absence of the manufacturer's recommendations follow Table 15.



**Figure 35
Wire Rope Clips**

(2) Wedge Sockets. Follow these assembly requirements for wedge sockets:

- (a) Wedge sockets must be assembled as recommended by the manufacturer or a qualified person.
- (b) Before installing a wedge socket on plastic coated or plastic impregnated wire rope the wedge socket manufacturer, wire rope manufacturer or a qualified person must be consulted.
- (c) The assembler must match the proper wedge with the socket for the wire rope to be installed. Wedges must not be interchanged between different manufacturers' sockets or models.

- (d) The live end of the wire rope in the wedge socket cavity must be in alignment with the socket's pin. See Figure 36, Wedge Sockets.
- (e) The length of the dead end tail of the wire rope must be as required by the manufacturer or a qualified person.
- (f) The tail of the dead end of the wire rope extending beyond the wedge socket must be secured as recommended by the wedge socket manufacturer or a qualified person.
- (g) The dead end of the wire rope must not be secured to the live end of the wire rope in a way that restricts the movement of the live end. See Figure 36.
- (h) After assembly the connection must be loaded to fully seat the wedge before use.

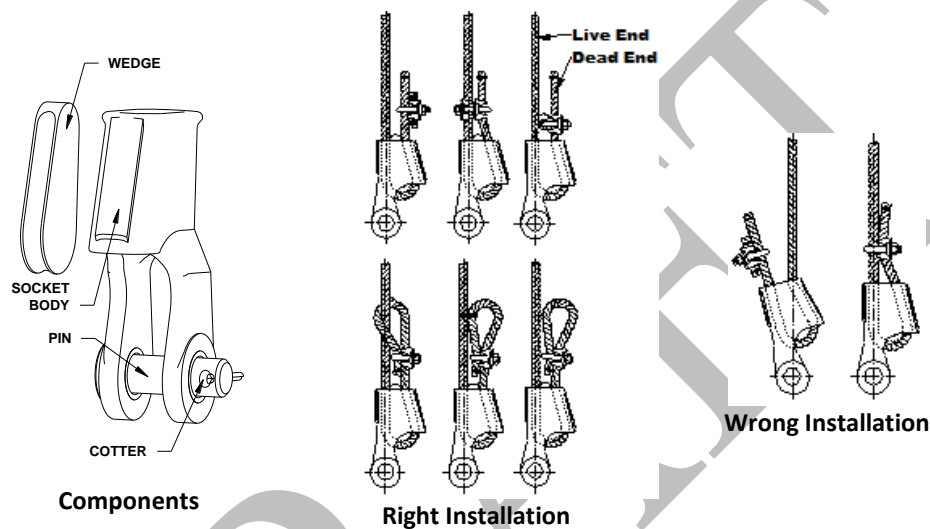


Figure 36
Wedge Sockets

WAC 296-155-56020 Links, rings, and swivels.

(1) Follow these rigging practices for links and rings:

- (a) The link or ring must be of the proper shape and size to make sure it seats properly in the hook or lifting device.
- (b) Multiple slings or rigging hardware gathered in a link or ring must not exceed a 120 degree included angle. See Figure 33, Angle of Loading.

Note: See Figure 37, Links and Rings, for examples of links and rings covered by this rule.

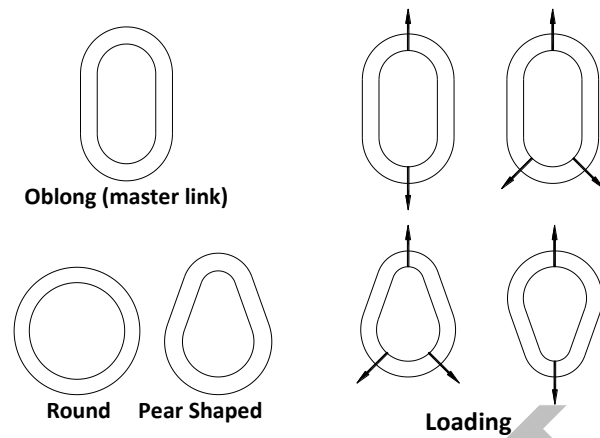


Figure 37
Links and Rings

(2) Follow these rigging practices for swivels:

(a) Swivels must only be used on in-line loads. See Figure 38, Swivels.

Note: Swivels are positioning hardware, and are not intended to be rotated under load

(b) Swivels must be of the proper shape and size to make sure it seats correctly in the hook or lifting device.

(c) All swivel components must be kept in good working condition.

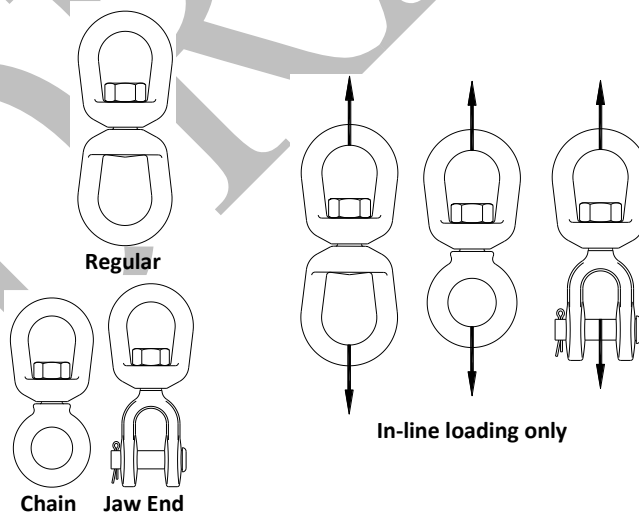


Figure 38
Swivels

WAC 296-155-56025 Rigging blocks.

- (1) The rigging block components must be fully engaged, with all fasteners and retaining devices in place and in good working order before use.
- (2) The rope must be in the sheave groove when the rigging block begins to take load.
- (3) The load line multiplied by the block load factor must not exceed the rated load of the rigging block. See Figure 39, Block Load Factor Multipliers.
- (4) Load line fittings must not contact the rigging block sheave(s).

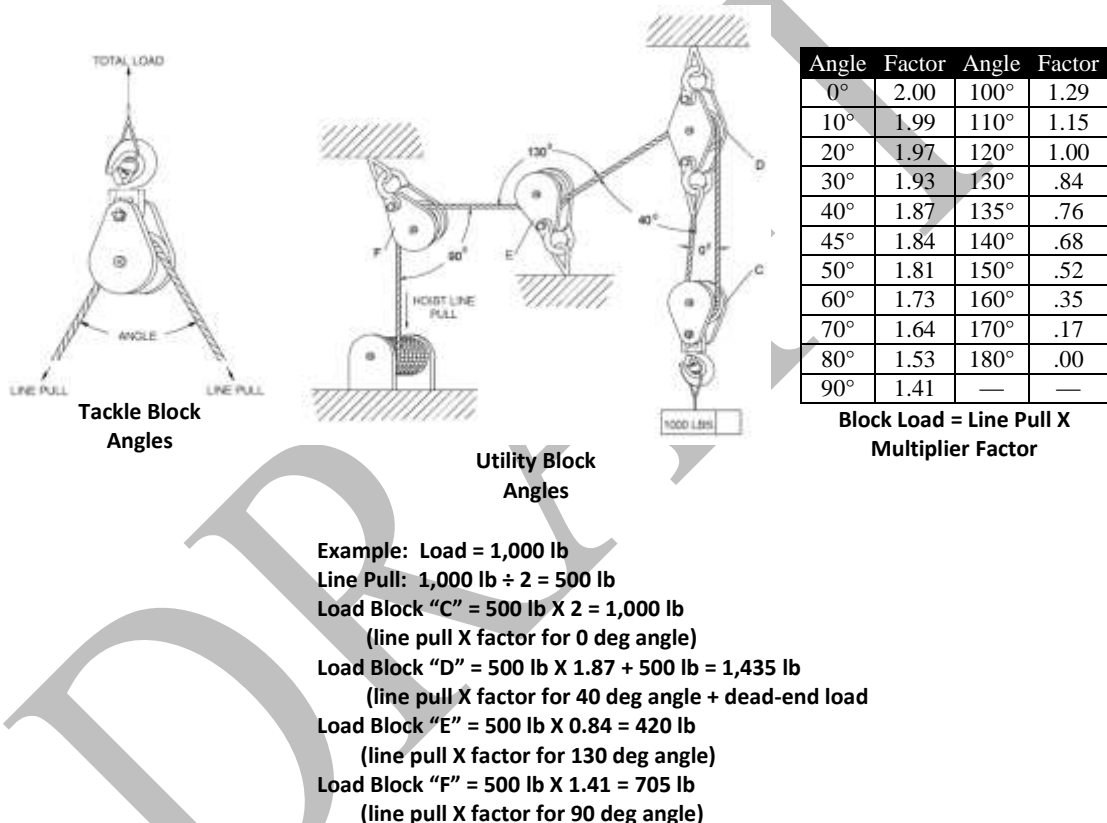


Figure 39

Block Load Factor Multipliers

WAC 296-155-562 Lifting devices other than slings and rigging hardware.

WAC 296-155-56200 Structural and mechanical lifters.

- (1) Structural and mechanical lifting devices must be constructed in accordance with ASME B30.20-2010, Below the Hook Lifting Devices, if you are making your own devices.

(2) The rated load of the lifting device must be legibly marked on the main structure or on a tag attached to it where it is visible. If the lifting device is made up of several lifters, each detachable from the group, these lifters must also be marked with their individual rated loads.

(3) All structural and mechanical lifting devices must be marked with the following information:

- (a) Manufacturer's name and address.
- (b) Serial number.
- (c) Lifter weight, if over 100 lbs (45 kg).
- (d) Rated load as required in subsection (2) of this section.
- (e) Name and address of repairer or modifier, when the lifting device has been repaired or modified.

(4) Inspection.

(a) A qualified person must inspect all new, altered, repaired, or modified lifting devices according to Tables 30 and 31. The inspection of altered, repaired or modified lifting devices can be limited to the parts affected, if a qualified person determines that is all that is needed.

(b) The operator must inspect the lifting device before and during every lift for any indication of damage. Check the following items:

- (i) Surface of the load for debris.
- (ii) Condition and operation of the controls.
- (iii) Condition and operation of the indicators and meters when installed.

(c) Lifting devices must be inspected, by the operator or another competent person, according to Table 30.

- (i) If any damage is found, have a qualified person determine whether there is a hazard.
- (ii) Hazardous conditions must be corrected before continuing use.

Table 30
Structural and Mechanical Lifter Frequent Inspection

Inspect for:	How often:
Structural members for: <ul style="list-style-type: none"> • Deformation. • Cracks. • Excessive wear on any part of the lifter. 	<ul style="list-style-type: none"> • Normal service – monthly. • Heavy service – weekly to monthly. • Severe service – daily to weekly. • Special or infrequent service – as recommended by a qualified person before and after each occurrence. • Before use, when any lifter has been idle for at least one month.
The device for: <ul style="list-style-type: none"> • Loose or missing: <ul style="list-style-type: none"> - Guards. - Fasteners. - Covers. - Stops. - Nameplates. 	
<ul style="list-style-type: none"> • All functional operating mechanisms for maladjustments interfering with operation. 	
<ul style="list-style-type: none"> • Automatic hold-and-release mechanisms for maladjustments interfering with operation. 	

(d) A qualified person must perform a periodic inspection on structural and mechanical lifters according to Table 31. Include the items in Table 30 above.

- (i) Hazardous conditions must be corrected before continuing use.
- (ii) Dated inspection reports must be kept of the most recent periodic inspection.

Table 31
Structural and Mechanical Lifting Device Periodic Inspection

Inspect for:	How often:
Loose bolts or fasteners.	<ul style="list-style-type: none"> • Normal service for equipment in place – yearly. • Heavy service semiannually. • Severe service – quarterly. • Special or infrequent service – as recommended by a qualified person before the first such occurrence and as directed by the qualified person for any subsequent occurrences.
Cracked or worn gear, pulleys, sheaves, sprockets, bearings, chains, and belts.	
Excessive wear of friction pads, linkages, and other mechanical parts.	
Excessive wear at hoist hooking points and load support clevises or pins.	

(5) Operational tests.

(a) A qualified person must perform an operational test on new, altered, repaired, or modified lifters before use. The qualified person can limit the testing of altered, repaired or modified lifters to the parts affected.

(b) The following items must be tested:

- (i) Lifters with moving parts must be tested to determine that the lifter operates according to the manufacturer's instructions.
- (ii) Lifters with manually operated or automatic latches must be tested to determine that the latch operates according to manufacturer's instructions.
- (iii) All indicator lights, gages, horns, bells, alarms, pointers, and other warning devices must be tested.

(c) Dated reports must be kept of all operational tests.

(6) Repair.

(a) Structural and mechanical lifting devices must be repaired as follows:

- (i) Adjustments and testing must be done only by a qualified person.
- (ii) Replacement parts used must be at least equal to the original manufacturer's specifications.
- (iii) The device must be inspected according to subsection (4) of this section before returning to service.

(b) The following precautions must be taken before repairs on a lifting device are started:

- (i) Disconnect, lock out and tag all sources of power "Out of Service", if applicable.
- (ii) Tag the lifting device removed from service for repair "Out of Service"

(7) Lifting devices must be operated only by qualified personnel.

(8) Operators must do the following:

- (a) Test all controls before use each shift.
- (b) Consult a competent person before handling the load whenever there is any doubt as to safety.
- (c) Respond only to instructions from competent persons, except for stop signals. The operator must obey a stop order at all times, no matter who gives it.
- (d) Do not load the lifting device in excess of its rated load or with any load that it isn't specifically designed for.
- (e) Apply the lifter to the load according to the instruction manual.
- (f) Check that:
 - (i) Lifter ropes or chains are not kinked.
 - (ii) Multiple part lines are not twisted around each other.

- (g) Bring the lifter over the load in a way that minimizes swinging.
- (h) Keep the load or lifter from contact with any obstruction.
- (i) Set down any attached load and store the lifting device before leaving it.
- (j) Check that all personnel are clear of the load.
- (k) Using the lifter for side pulls or sliding the load is prohibited, unless specifically authorized by a qualified person.
- (l) Riding on loads or the lifting device is prohibited.

WAC 296-155-56205 Vacuum lifters.

(1) Rated load. The rated load, maximum width, maximum length, and minimum thickness of the load must be legibly marked on the main structure or on a tag attached to it where it is visible. If the vacuum lifting device has shut-off valves on individual pads or groups of pads, the rated load of each pad must also be marked.

(2) The vacuum lifter must be clearly marked on the main structure with all of the following:

- (a) Manufacturer's name and address.
- (b) Model Number.
- (c) Serial Number.
- (d) Lifter weight.
- (e) Electrical power requirements, if applicable.
- (f) Pressure and volume of compressed air required, if applicable.
- (g) Rated load, as required in subsection (1) of this section.
- (h) If repaired or modified, the name, address, and lifter identification of repairer or modifier.

(3) Installation.

- (a) Vacuum lifters must be assembled and installed according to manufacturer's instructions.
- (b) The installer must check:
 - (i) That the power supply is the same as what is shown on the nameplate.
 - (ii) For correct rotation of all motors.
- (c) Connect the electrical power supply to the vacuum lifter to either:
 - (i) The line side of the crane disconnect; or
 - (ii) An independent circuit.

(4) Inspection.

- (a) A qualified person must inspect all new, altered, repaired, or modified vacuum lifters. A qualified person can limit the inspection of altered, repaired or modified lifters to the affected parts.

- (b) The operator must inspect the lifter before and during every lift for any indication of damage, including all of the following:
- (i) Surface of the load for debris.
 - (ii) Seal of the vacuum pad for debris.
 - (iii) Condition and operation of the controls.
 - (iv) Condition and operation of the indicators, meters and pumps when installed.
- (c) Lifters must be inspected, by the operator or another competent person, according to Table 32.
- (d) A qualified person must determine whether signs of damage indicate a hazard
- (e) Hazardous conditions must be corrected before continuing use.
- (f) A qualified person must perform a periodic inspection of vacuum lifters according to Table 33. Include the items in Table 32 above.
- (g) Dated inspection records must be kept on all critical items such as, supporting structure, motors, controls, and other auxiliary components.
- (h) Hazardous conditions must be corrected before continuing use.

Table 32
Vacuum Lifter Frequent Inspection

Inspect:	How often:
Structural members for: <ul style="list-style-type: none"> • Deformation. • Cracks. • Excessive wear. 	<ul style="list-style-type: none"> • Normal service – monthly. • Heavy service – weekly to monthly. • Severe service – daily to weekly. • Special or infrequent service – as recommended by a qualified person before and after each occurrence.
The vacuum generator for output.	
The vacuum pad seal rings for: <ul style="list-style-type: none"> • Cuts. • Tears. • Excessive wear. • Foreign particles. 	
Vacuum lines and connections for: <ul style="list-style-type: none"> • Leakage. • Cuts. • Kinks. • Collapsed areas of hoses. 	
The vacuum reservoir for: <ul style="list-style-type: none"> • Leaks. • Visible damage. 	
The entire vacuum system including indicator lights, gages, horns, bells, pointers or other warning devices, and vacuum level indicators: <ul style="list-style-type: none"> • Attach a nonporous, clean surface to the vacuum pad or pads. • Stop the vacuum source. • Check that the vacuum level in the system does not decrease by more than the manufacturer's specified rate. 	<ul style="list-style-type: none"> • Before using, when a lifting device has been idle for more than one month.

Table 33
Vacuum Lifting Device Periodic Inspection

Inspect for:	How often:
External evidence of: <ul style="list-style-type: none"> • Looseness. • Wear. • Deformation. • Cracking. • Corrosion. 	<ul style="list-style-type: none"> • Normal service for equipment in place – yearly • Heavy service – semiannually • Severe service – quarterly • Special or infrequent service – as recommended by a qualified person before the first such occurrence and as directed by the qualified person for any subsequent occurrences.
External evidence of damage to: <ul style="list-style-type: none"> • Supporting structure. • Motors. • Controls. • Other auxiliary components. 	
Clear warning labels.	

(5) Operational tests.

(a) A qualified person must perform an operational test on new, altered, repaired, or modified vacuum lifters before use. The qualified person can limit the testing of altered, repaired or modified lifters to the parts affected.

(b) The following items must be tested:

- (i) Moving parts.
- (ii) Latches.
- (iii) Stops.
- (iv) Limit switches.
- (v) Control devices.
- (vi) Vacuum lines.
- (vii) The seals and connections must be tested for leaks by attaching a smooth nonporous clean material to the vacuum pad or pads and then stopping the vacuum source. The vacuum level in the system must not decrease more than the manufacturer's specified rate.

(c) Dated reports of all operations tests on file must be filed.

(6) Load tests.

(a) Prior to initial use, all new, altered, repaired, or modified vacuum lifting devices must be load tested and inspected by a qualified person. The qualified person can limit the test to the areas affected by the alteration, repair or modification.

(b) Test loads must not be more than 125 percent of the rated load of the system, unless otherwise recommended by the manufacturer or a qualified person.

(c) Written reports must be kept confirming the load rating of the vacuum lifting device.

(d) The load test must consist of one of the following procedures:

- (i) Actual load test
 - (A) Attach pads to the designated test load.
 - (B) Raise the test load a small distance to make sure the load is supported by the vacuum-lifting device.
 - (C) Hold the load for two minutes.
 - (D) Lower the load for release.
 - (ii) Simulated load test. Using a test fixture, apply forces to all load bearing components either individually or in assemblies equivalent to the forces encountered by the components if they were supporting a load that was 125% of the rated load.
- (e) After the test, the vacuum lifting device must be visually inspected. Any condition that constitutes a hazard must be corrected before the lifting device is placed in service. If the correction affects the structure, then the lifter must be retested.
- (7) Repair.
- (a) Repair vacuum lifting devices as follows:
 - (i) Adjustments and testing must be done only by a qualified person.
 - (ii) Use replacement parts that are at least equal to the original manufacturer's specifications.
 - (iii) The lifting device must be inspected before returning to service as required in subsection (4) of this section.
 - (b) Take the following precautions before repairs on a lifting device are started:
 - (i) Move the vacuum-lifting device to an area where it will cause the least interference with other operations.
 - (ii) Disconnect, lock out and tag all sources of power "Out of Service", if applicable.
 - (iii) Tag the lifting device removed from service for repair "Out of Service"
- (8) Lifting devices must be operated only by qualified personnel.
- (9) Operators must do the following:
- (a) Test all controls before use during a shift.
 - (b) Consult a competent person before handling the load whenever safety is in doubt
 - (c) Respond only to instructions from competent persons, except for stop orders. The operator must obey a stop order at all times, no matter who gives it.
 - (d) Do not load the lifter in excess of its rated load or with any load that it isn't specifically designed for.
 - (e) Apply the lifter to the load according to the manufacturer's instructions.
 - (f) Check that:
 - (i) Ropes or chains are not kinked.
 - (ii) Multiple part lines are not twisted around each other.
 - (iii) The pad contact surface is clean and free of loose particles.

- (g) Check that vacuum lines are not:
 - (i) Kinked or twisted.
 - (ii) Wrapped around or looped over parts of the lifting device that will move during the lift.
- (h) Bring the lifter over the load in a way that minimizes swinging.
- (i) Lift the load a few inches to make sure that the lifting device was correctly applied.
- (j) Keep the load or lifter from contact with any obstruction.
- (k) Do the following if power goes off while making a lift:
 - (i) Warn all people in the area;
 - (ii) Set the load down if possible.
- (l) Set down any attached load and store the lifting device before leaving it.
- (m) Check that all personnel are clear of the load.
- (n) Using the lifter for side pulls or sliding the load is prohibited, unless specifically authorized by a qualified person.
- (o) Riding on the load or the lifter is prohibited.

WAC 296-155-56210 Close proximity lifting magnets.

(1) Rated load.

- (a) General application magnets must have the rated load (capacity) marked either on the lifting magnet or on a tag attached to it. The marking must refer to the instruction manual for information about decreases in rating due to the loads.
 - (i) Surface condition.
 - (ii) Thickness.
 - (iii) Percentage of contact with the magnet.
 - (iv) Temperature.
 - (v) Metallurgical composition.
 - (vi) Deflection.
- (b) Specified application magnets must have the rated load (capacity) either on the lifting magnet or on a tag attached to it, referring to the specific loads for which the capacity applies.

(2) Identification.

- (a) All close proximity lifting magnets must be marked with the following information:
 - (i) Manufacturer's name and address.
 - (ii) Model and lifting magnet unit identification.
 - (iii) Weight of lifting magnet.
 - (iv) Rated load, as required in subsection (1) of this section.
 - (v) Duty cycle, if applicable.
 - (vi) Cold current (amps) at 68 degrees F (20 degrees C), if applicable.

- (vii) Voltage of primary power supply or battery, if applicable.
- (b) All close proximity magnets must be marked with the following information, if repaired or modified:
 - (i) Name and address of repairer or modifier.
 - (ii) Repairer or modifier's unit identification.
 - (iii) Any alterations to the following:
 - (A) Weight of magnet.
 - (B) Duty cycle.
 - (C) Cold current or wattage at 68 degrees F (20 degrees C).
 - (D) Voltage of the primary power supply or battery.
 - (E) Rated load.
- (3) Lifting magnets must be installed according to manufacturer's instructions.
- (4) Inspection.
 - (a) A qualified person must inspect all new, altered, repaired, or modified lifting magnets according to Tables 34 and 35. The inspection of altered, repaired or modified lifting magnets can be limited to the parts affected, if a qualified person determines that is all that is needed.
 - (b) The operator must inspect the lifting magnet before and during every lift for any indication of damage. Check all of the following items:
 - (i) Lifting magnet face and surface of the load for foreign materials and smoothness;
 - (ii) Condition and operation of the:
 - (A) Control handle of a manually controlled permanent magnet;
 - (B) Indicators and meters when installed.
 - (c) Lifting magnets must be inspected, by the operator or another competent person, according to Table 34.
 - (d) A qualified person must determine whether signs of damage indicate a hazard.
 - (e) Hazardous conditions must be corrected before continuing use.

Table 34
Close Proximity Lifting Magnet Frequent Inspection

Inspect:	How often:
Structural and suspension members for: <ul style="list-style-type: none"> • Deformation. • Cracks. • Excessive wear on any part of the lifting magnet. 	<ul style="list-style-type: none"> • Normal service – monthly • Heavy service – weekly to monthly • Severe service – daily to weekly • Special or infrequent service – as recommended by a qualified person before and after each occurrence • Before using, when a lifting magnet has been idle for more than one month.
The lifting magnet face for: <ul style="list-style-type: none"> • Foreign materials. • Smoothness. 	
Condition of lifting bail or sling suspension.	
Condition and operation of control handle.	
Condition and operation of indicators and meters, if applicable.	
Electrical conductors, if applicable, that are visible without disassembly for: <ul style="list-style-type: none"> • Loose connections. • Continuity. • Corrosion. • Damage to insulation. 	
Battery operated electromagnets for: <ul style="list-style-type: none"> • Proper level of battery electrolyte. • Corrosion of battery posts or connectors. 	
Cracked housings, welds, and loose bolts.	
Labels and marking.	

(f) A qualified person must perform periodic inspections of close proximity lifting magnets according to Table 35. Include the items in Table 34 above.

(g) Dated inspection records must be kept on all critical items such as, structural and suspension members, lifting magnet face, lifting bail, control handle, indicators and meters.

(h) Hazardous conditions must be corrected before continuing use.

Table 35
Close Proximity Lifting Magnet Periodic Inspection

Inspect:	How often:
Members, fasteners, locks, switches, warning labels, and lifting parts for: <ul style="list-style-type: none"> • Deformation. • Wear. • Corrosion. 	<ul style="list-style-type: none"> • Normal service for equipment in place – yearly • Heavy service, unless external conditions indicate that disassembly should be done to permit detailed inspection – quarterly • Severe service—monthly • Special or infrequent service – as recommended by a qualified person before the first occurrence and as directed by the qualified person for any subsequent occurrences.
All electrical components, including controllers, battery, external power supply, power disconnects, meters, indicators, and alarms for: <ul style="list-style-type: none"> • Proper operation. • Condition. 	
Lifting magnet coil must be tested for: <ul style="list-style-type: none"> • Ohmic and ground readings compared to manufacturer's standards. 	

(5) Operational tests.

(a) All new, altered, repaired and modified lifting magnets must be tested either by or under the direction of a qualified person before use. A qualified person can limit the testing of altered, repaired or modified lifting magnets to the parts affected.

(b) The following items must be tested:

- (i) Moving parts.
- (ii) Latches.
- (iii) Stops.
- (iv) Switches.
- (v) Control devices.
- (vi) Alarms.
- (vii) Warning devices, including:
 - (A) Indicator lights.
 - (B) Gauges.
 - (C) Horns.
 - (D) Bells.
 - (E) Pointers.

(c) Dated reports of all operations tests must be kept.

(6) Load tests.

(a) Load tests must be performed in accordance with ANSI B30.20-2010 on close proximity lifting devices that are:

- (i) New.
- (ii) Altered.
- (iii) Repaired.
- (iv) Modified.

Note: A qualified person can limit the test to the areas affected by the alteration, repair or modification.

(b) The breakaway force of lifting magnets must be tested according to manufacturer's directions or ANSI B20.3-2006.

(7) Repair.

(a) Close proximity lifting magnets must be repaired as follows:

- (i) Adjustments and testing must be done by or under the direction of a qualified person.
- (ii) Replacement parts used must be at least equal to the original manufacturer's specifications.
- (iii) The magnet must be inspected before returning to service as required in subsection (4) of this section.

(b) The following precautions must be taken before repairs on a magnet are started:

- (i) Disconnect, lock out and tag all sources of power "Out of Service", if applicable.
- (ii) Tag any lifting magnet removed from service for repair "Out of Service"

(8) Lifting magnets must be operated only by qualified personnel.

(9) Operators must do the following:

- (a) Test all controls before use each shift.
- (b) Check all meters and indicators for proper operation before making a lift.
- (c) Consult a competent person before handling the load whenever there is any doubt as to safety.
- (d) Respond only to instructions from competent persons, except for stop orders. Operators must obey a stop order at all times, no matter who gives it.
- (e) Do not load the lifting magnet in excess of its rated load or with any load that it isn't specifically designed for.
- (f) Apply the magnet to the load according to the instruction manual.
- (g) Check that:
 - (i) Lifter ropes or chains are not kinked;
 - (ii) Multiple part lines are not twisted around each other;

- (iii) The lifting magnet face and the contact area on the load are clean.
- (h) Bring the magnet over the load in a way that minimizes swinging.
- (i) Lift the load a few inches to make sure that the lifting magnet has been correctly applied.
- (j) Keep the load or lifting magnet from contact with any obstruction.
- (k) Set down any attached load and store the lifting magnet before leaving it.
- (l) Check that all people near the lift are warned before lifting.
- (m) Using the lifter for side pulls or sliding the load is prohibited, unless specifically authorized by a qualified person;
- (o) Riding on loads or the lifting magnet is prohibited.

WAC 296-155-56215 Remotely operated lifting magnets.

(1) Identification.

- (a) All remotely operated lifting magnets must be marked with the following information:
 - (i) Manufacturer's name and address;
 - (ii) Model or unit identification;
 - (iii) Weight of lifting magnet;
 - (iv) Duty cycle;
 - (v) Cold current;
 - (vi) Voltage.
- (b) Remotely operated lifting magnets must be marked with the following items, if repaired or modified:
 - (i) Name and address of repairer or modifier.
 - (ii) Repairer or modifier's unit identification.
 - (iii) Rated load.
 - (iv) Any alterations to:
 - (A) Weight of magnet.
 - (B) Duty cycle.
 - (C) Cold current or wattage at 68 degrees F.
 - (D) Voltage of the primary power supply or battery.

(2) Lifting magnets must be installed according to manufacturer's instructions.

(3) Inspections.

- (a) A qualified person must inspect all new, altered, repaired or modified lifting magnets according to Tables 36 and 37. A qualified person can limit the inspection of altered, repaired or modified lifting magnets to the parts affected.
- (b) Lifting magnets must be inspected, by the operator or another competent person, according to Table 36.
- (c) A qualified person must determine whether signs of damage indicate a hazard.
- (d) Hazardous conditions must be corrected before continuing use.

- (e) A qualified person must perform periodic inspections of remotely operated lifting magnets according to Table 37. Include the items in Table 36.
- (f) Make records of apparent external conditions to provide the basis for a continuing evaluation.
- (g) Hazardous conditions must be corrected before continuing use.

Table 36
Remotely Operated Lifting Magnet Frequent Inspection

Inspect:	How often:
Structural and suspension members for <ul style="list-style-type: none"> • Deformation • Cracks • Excessive wear on any part of the lifting magnet 	<ul style="list-style-type: none"> • Normal service – monthly • Heavy service – weekly to monthly • Severe service – daily to weekly • Special or infrequent service – as recommended by a qualified person before and after each occurrence • Before using, when a lifting magnet has been idle for more than one month.
The lifting magnet face for <ul style="list-style-type: none"> • Foreign materials • Smoothness 	
Electrical conductors that are visible without disassembly	
Cracked housings, welds, and loose bolts	

Table 37
Remotely Operated Lifting Magnet Periodic Inspection

Inspect:	How often:
<i>Members, fasteners, and lifting parts for</i> <ul style="list-style-type: none"> • Deformation • Wear • Corrosion 	<ul style="list-style-type: none"> • Normal service for equipment in place – yearly • Heavy service– quarterly • Severe service–monthly • Special or infrequent service – as recommended by a qualified person before the first occurrence and as directed by the qualified person for any subsequent occurrences.
All electrical components for <ul style="list-style-type: none"> • Proper operation • Condition 	
Magnet coil, for <ul style="list-style-type: none"> • Ohmic and ground readings compared to manufacturer's standards 	

(4) Operational tests.

(a) All new, altered, repaired and modified lifting magnets must be tested either by or under the direction of a qualified person before use. The qualified person can limit the testing of altered, repaired or modified lifting magnets to the parts affected.

(b) The following items must be tested:

- (i) All electrical equipment for proper operation
 - (ii) Warning devices, including
 - (A) Indicator lights
 - (B) Gauges
 - (C) Horns
 - (D) Bells
 - (E) Pointers
 - (c) Keep dated reports of all operations tests.
- (5) Repair.
- (a) Remotely operated lifting magnets must be repaired as follows:
 - (i) Have adjustments and testing done only by or under the direction of a qualified person
 - (ii) Use replacement parts that are at least equal to the original manufacturer's specifications
 - (iii) Inspect the lifter according to subsection (3) of this section, before returning to service.
 - (b) The following precautions must be taken before repairs on a lifter are started:
 - (i) Disconnect, lock out and tag all sources of power "Out of Service".
 - (ii) Tag any magnet removed from service for repair "Out of Service"
- (6) Lifting devices must be operated only by qualified personnel.
- (7) Operators must do the following:
- (a) Test all controls before use during a shift.
 - (b) Consult a competent person before handling the load whenever there is any doubt as to safety.
 - (c) Respond only to instructions from competent persons, except for stop orders. Operators must obey a stop order at all times, no matter who gives it.
 - (d) Don't load the lifting magnet in excess of its rated load or with any load that it isn't specifically designed for.
 - (e) Apply the lifting magnet to the load according to the instruction manual.
 - (f) Check that:
 - (i) Lifter ropes or chains are not kinked;
 - (ii) Multiple part lines are not twisted around each other.
 - (g) Bring the lifting magnet over the load in a way that minimizes swinging.
 - (h) Keep the load or magnet from contact with any obstruction.
 - (i) Set down any attached load and store the lifting magnet before leaving it.
 - (j) Check that all people are clear of the load.
 - (k) Using the lifter for side pulls or sliding the load is prohibited, unless specifically authorized by a qualified person;

- (l) Riding on loads or the lifting magnet is prohibited.

WAC 296-155-56220 Scrap and material handling grapples.

- (1) All grapples must be marked with the following information:
 - (a) Manufacturer's name and address;
 - (b) Serial number or unit identification;
 - (c) Grapple weight;
 - (d) Rated voltage, if applicable;
 - (e) Operating hydraulic pressure(s), if applicable;
 - (f) Rated capacity;
 - (g) The following items, if repaired or modified:
 - (i) Name and address of repairer or modifier;
 - (ii) Repairer or modifier's unit identification;
 - (iii) Grapple weight, if altered;
 - (iv) Operating hydraulic pressure, if altered;
 - (v) Rated voltage, if altered;
 - (vi) Rated capacity if altered.
- (2) Grapple installation.
 - (a) Grapples must be installed according to manufacturer's instructions.
 - (b) The hydraulic flows and pressures must be the same as shown in the manufacturer's instructions.
- (3) Inspections.
 - (a) A qualified person must inspect all new, altered, repaired and modified grapples according to Table 38. A qualified person can limit the inspection of altered, repaired or modified grapples to the parts affected.
 - (b) Grapples must be visually inspected each shift they are used, by the operator or another competent person, according to Table 38.
 - (c) A qualified person must determine whether signs of damage indicate a hazard.
 - (d) Hazardous conditions must be corrected before continuing use.

Table 38
Grapple Frequent Inspection

Inspect:	How often:
Structural members for: <ul style="list-style-type: none"> • Deformation. • Cracks. • Excessive wear on any part of the grapple. 	<ul style="list-style-type: none"> • Normal service – monthly • Heavy service – weekly to monthly • Severe service – daily to weekly • Special or infrequent service – as recommended by a qualified person before and after each occurrence.
Pins and bushings.	
Hydraulic lines.	
Hydraulic cylinders.	
Loose bolts.	
Electrical conductors that are visible without disassembly.	<ul style="list-style-type: none"> • Before using, when a grapple has been idle for more than one month.

(e) A qualified person must perform a periodic inspection of grapples according to Table 39. Include the items from Table 38 above.

(f) Data inspection reports must be kept on critical items such as, structural members, fasteners, lifting parts, hydraulic hoses, fittings and tubing, hydraulic motors and hydraulic cylinders.

(g) Hazardous conditions must be corrected before continuing use.

Table 39
Grapple Periodic Inspection

Inspect:	How often:
<p>Members, fasteners, and lifting parts for:</p> <ul style="list-style-type: none"> • Deformation. • Wear. • Corrosion. 	<ul style="list-style-type: none"> • Normal service for equipment in place – yearly • Heavy service, unless external conditions indicate that disassembly should be done to permit detailed inspection] – quarterly • Severe service—monthly • Special or infrequent service – as recommended by a qualified person before the first occurrence and as directed by the qualified person for any subsequent occurrences.
<p>Hydraulic hose, fittings, and tubing for:</p> <ul style="list-style-type: none"> • Evidence of leakage at the surface of the hose or its junction with metal couplings. • Blistering or abnormal deformation of the outer covering of the hose. • Leakage at threaded or clamped joints that cannot be eliminated by normal tightening or recommended procedures. • Excessive abrasion or scrubbing on the outer surface of hoses, rigid tubes, or fittings. 	
<p>Hydraulic motors for:</p> <ul style="list-style-type: none"> • Loose bolts or fasteners. • Leaks at joints between sections. • Shaft seal leaks. • Unusual noises or vibration. • Loss of operating speed. • Excessive heating of the fluid. • Loss of pressure. 	
<p>Hydraulic cylinders for:</p> <ul style="list-style-type: none"> • Drifting caused by fluid leaking across the piston seals. • Rod seal leakage. • Leaks at welded joints. • Scored, nicked, or dented cylinder rods. • Dented case (barrel). • Loose or deformed rod eyes or connecting joints. 	
<p>All electrical components, including meters, indicators and alarms for:</p> <ul style="list-style-type: none"> • Proper operation. • Condition. 	

(4) Operational tests.

(a) New, altered, repaired or modified grapples must be tested either by or under the direction of a qualified person before use. The qualified person can limit the testing of altered, repaired or modified grapples can be limited to the parts affected.

(b) All warning devices must be tested, including:

- (i) Indicator lights;
- (ii) Gauges;
- (iii) Horns;
- (iv) Bells;
- (v) Pointers;
- (vi) Other warning devices.

(c) Dated reports of all operations tests must be kept on file.

(5) Repair.

(a) Grapples must be repaired as follows:

- (i) Have adjustments and testing done only by or under the direction of a qualified person;
- (ii) Use replacement parts that are at least equal to the original manufacturer's specifications;
- (iii) Inspect the grapple according to subsection (3) of this section, before returning to service;

(b) The following precautions must be taken before repairs on a grapple are started:

- (i) Disconnect, lock out and tag all sources of power "Out of Service";
- (ii) Tag any grapple removed from service for repair "Out of Service".

(6) Grapples must be operated only by qualified personnel.

(7) Operators must do the following:

- (a) Test all controls before use during a shift.
- (b) Check all meters and indicators for proper operation before making a lift.
- (c) Consult a competent person before handling the load whenever there is any doubt as to safety.
- (d) Respond only to instructions from competent persons, except for stop orders. An operator must obey a stop order at all times, no matter who gives it.
- (e) Do not load grapples in excess of the rated load or with any load that they are not specifically designed for.
- (f) Apply the grapple to the load according to the instruction manual.
- (g) Bring the grapple over the load in a way that minimizes swinging.
- (h) Keep the load or grapple from contact with any obstruction.
- (i) Set down any attached load and store the grapple before leaving it.
- (j) Don't let anyone ride on loads or the grapple.

(k) Check that all people stay clear of the load.

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